HOUSEKEEPING OUR HERITAGE:

Practical Advice for Alberta Collections

Alberta

PROVINCIAL MUSEUM OF ALBERTA
12845 - 102 Avenue
Edmonton, Alberta
T5N 0M6

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REVISED OCTOBER 1984

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INTRODUCTION

This booklet is not intended as a "how-to" on conservation, repair or restoration. It has been written to provide staff of the museums and art galleries of Alberta with basic practical advice on the storage and maintenance of their collections. For additional information, we urge you to request the excellent free publications from The Canadian Conservation Institute and to obtain the relevant books from the Bibiliography.

Should any serious conservation problems occur, please consult a conservator as soon as possible before attempting any repairs. As every artifact is unique in materials, construction and past history, no two objects will respond in exactly the same way to either causes of damage or treatment methods. The following steps will simplify the conservator's job, and cut down the time and cost of repair work.

1. Remove the object(s) from the source of damage, such as leaks.

2. Gather up and save all of the broken-off pieces and chips, no matter how small. Give these to the conservator along with the object.

3. Tell the conservator when and how the damage happened, when it was noticed, and what changes have occured since.

4. Tell the conservator of the object's past physical history, and of any previous repairs.

Ninety percent of the damage to a collection, barring earthquakes, floods and other natural disasters, can be avoided by good storage and handling techniques. Housework is always dreary; it is hoped that this will make the chores a little easier to cope with.

If you have problems not covered in this booklet, or have questions about which materials to use, call the Conservator at the Provincial Museum for assistance at (403) 427-1730. You can use the RITE line in Alberta to call toll-free.

Where brand names have been mentioned, it is because they were the best that we knew of at time of printing; it does not mean that there are not other brands or suppliers equally suitable.

Supplier's addresses for the materials mentioned have been included. Prices are as of October 1984 and are subject to rapid change.

PUBLICATIONS AVAILABLE FROM THE CCI/PUBLICATIONS DE L'ICC

Journals/Journaux

J1 CCI/ICC Journal Volume 1/1976
J2 No Longer Available/Edition épuisée
J3 CCI/ICC Journal Volume 3/1978
J4 CCI/ICC Journal Volume 4/1980

Technical Bulletins/Bulletins techniques

TB1 Relative Humidity; Its Importance, Measurement & Control in Museums/L'humidité relative dans les musées; importance, mesure et régulation
TB2 Museum Lighting/L'éclairage des musées
TB3 Recommended Environmental Monitors for Museums, Archives and Art Galleries/Appareils recommandés pour la vérification des conditions ambiantes dans les musées et les dépôts d'archives by/par R.H. Lafontaine
TB4 Care of Musical Instruments in Canadian Collections/Le soin des collections canadiennes d'instruments de musique by/par R.L. Barclay
TB5 Environmental Norms for Canadian Museums, Art Galleries and Archives/Normes relatives au milieu pour les musées et les dépôts d'archives canadiens by/par R.H. Lafontaine
TB6 No Longer Available/Edition épuisée
TB7 Fluorescent Lamps/Les lampes à fluorescence by/par R.H. Lafontaine
TB8 The Care of Wooden Objects/L'entretien des objets en bois by/par R.L. Barclay, A. Todd and/et R. Eames
TB9 No Longer Available/Edition épuisée

CCI Notes/Notes ICC

Care of Collections - General Guidelines/Entretien des collections - principes généraux
N1/2 - Cleaning Glass and Acrylic Display Cases/Nettoyage des vitrines de verre et d'acrylique

The Museum Environment - Physical Factors/Les conditions ambiantes à l'intérieur du musée - facteurs physiques
N2/1 - Ultraviolet Filters for Fluorescent Lamps/Filtres anti-ultraviolets pour les lampes à fluorescence
N2/2 - Daylite Fluro-Spray Floodlight/Projecteur à faisceau divergent Daylite Fluro-Spray
N2/3 - Track Lighting/Projecteurs sur rails
N2/4 - CCI Environmental Monitoring Kit/Trousse de vérification du milieu ambiant
N2/5 - Using a Camera to Measure Light Levels/Mesure de l'éclairement au moyen d'un appareil photo

Ethnographic Materials/Objets ethnographiques
N6/1 - Care of Ivory, Bone, Horn and Antler/Entretien de l'ivoire, de l'os, de la corne et du bois de cervidé
N6/2 - Care of Basketry/Entretien de la vannerie
N6/3 - Care of Quillwork/Entretien des broderies en piquants de porc-épic

Leather, Skin and Fur/Cuir, peau et fourrure
N8/1 - Removing Mould from Leather/Nettoyage du cuir moisi
N8/2 - Care of Commercially Tanned Leather/Entretien du cuir industriel
N8/3 - Care of Mounted Specimens and Pelts/Entretien des spécimens naturalisés et des peaux
N8/4 - Care of Rawhide and Semi-Tanned Leather/Entretien du cuir brut et du cuir sommairement tanné

Metals/Métaux
N9/3 - The Cleaning, Polishing and Protective Waxing of Brass and Copper Objects/Nettoyage, polissage et cirage protecteur des objets en laiton et en cuivre

Paper and Books/Papier et livres
N11/1 - Protective Enclosures for Books and Paper Artifacts/Contenants protecteurs pour le rangement des livres et autres objets en papier

Textiles and Fibres/Textiles et fibres
N13/3 - Rolled Storage for Textiles/Enroulement des textiles en réserve
N13/4 - Velcro Support System for Textiles/Support Velcro pour textiles
N13/5 - Hanging Storage for Costumes/Suspension des costumes en réserve
N13/8 - Applying Accession Numbers to Textiles/Application des numéros d'acquisition aux textiles
N13/9 - Anionic Detergent/Détergent anionique

Reprints/Tirés à part

RO Reprints of articles written by CCI Scientists and Conservators are also available. A list of these articles will be sent out upon request./Vous pouvez aussi obtenir les tirés à part d'articles écrits par les scientifiques et les restaurateurs de l'ICC. Une liste de ces tirés à part vous sera envoyée sur demande.

ORDER FORM/FORMULE DE COMMANDE

Name/Nom:
Organization/Organisme:
Address/Adresse:

Request publications by the numbers (i.e., J1, TB8, R30, N8/4, etc.).
Indiquez le numéro de la publication désirée.

* When ordering CCI Notes stipulate french or English/Lorsque vous commandez les Notes ICC précisez texte anglais ou français

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Please send this order form to/Faire parvenir à:

Canadian Conservation Institute/Institut canadien de conservation
1030 Innes Road/chemin Innes
Ottawa, Ontario K1A 0M5

ALL PUBLICATIONS ARE SUPPLIED FREE OF CHARGE/TOUTES CES PUBLICATIONS SONT GRATUITES

TECHNICAL LEAFLETS — A SOURCE LIST

Anita Rush

Technical leaflets are small publications, usually two to eight pages long, which contain basic information on museum techniques. Small manuals (up to forty pages in length) can also be included in this category if they deal with museum practices, rather than theory. Technical leaflets are handy training and reference tools because they provide straightforward introductory material; they can not substitute, however, for journal articles and books, which offer much more detailed information. The advantages of leaflets lie in their small size, succinct content, and low cost (some are even free of charge).

Only major technical leaflet and small manual publishers or distributors have been noted here. Emphasis has been placed on Canadian and major foreign publications. Prices are quoted in the publisher's or distributor's currency — U.S. prices appear in U.S. dollars and British prices are given in pounds sterling. Before orders are placed, the publisher or distributor should be contacted for current price and title lists. Please note that inclusion in this source list does not imply that a leaflet or leaflet series is free of inaccuracies or out-dated information.

AASLH Technical Leaflets

The American Association for State and Local History (AASLH) is undoubtedly the most prolific technical leaflet publisher. Over 148 titles are available, covering a wide range of topics. Several are issued each year as inserts in *History News*, AASLH's monthly journal; as well, individual copies may be purchased separately. Single copies are $1.00 each (minimum order of $3.00); multiple copies are offered at reduced prices. The complete set of all 148 leaflets sells for $95.00. Prepackaged thematic series are also available. They include: administration (17 leaflets for $12.00); research (20 leaflets for $14.00); collections care (14 leaflets for $10.00); preservation (10 leaflets for $8.00); exhibits (24 leaflets for $16.00); and interpretation (15 leaflets for $11.00). For more information, contact AASLH, 708 Berry Rd., Nashville, Tenn. 37204.

Museum News Reprints

Reprints of *Museum News* articles are available from the American Association of Museums (AAM). A number of them deal with 'how-to' subjects and thus, in a sense, are technical leaflets. Prices vary from $.75 to $2.50. Discounts are offered on bulk purchases and to AAM members. Thematic reprint packages are available: The Essentials of Conservation ($7.25), The Essentials of Management ($4.00), and The Essentials of Collections Management ($4.25). The entire set of reprints is sold for $40.00. Send requests to AAM Publications, 1055 Thomas Jefferson St. NW, Washington, D.C. 20007.

BCPM Museum Methods Manuals

The British Columbia Provincial Museum has issued seven Museum Methods Manuals. Five are still in print: T. C. Brayshaw's *Plant Collection for the Amateur* (no. 1); Philip R. Ward's *Getting the Bugs Out* (no. 4); Harold Hosford's *Haven't You Overlooked Something? or The Pitfalls of Printing* (no. 5); Philip R. Ward's *In Support of Difficult Shapes* (no. 6); and R. Wayne Campbell and Harold Hosford's *Attracting and Feeding Birds in British Columbia* (no. 7). The latter two titles sell for $1.00 each; the others cost $.50 each. Inquiries and orders should be addressed to Publications, British Columbia Provincial Museum, Victoria, B.C., V8V 1X4. Tel. (604) 387-3701.

CCI Notes

The Canadian Conservation Institute has begun publication of a series of conservation leaflets, entitled CCI Notes. Five titles are available: *Ultraviolet Filters for Fluorescent Lamps, Daylite Fluro-Spray Floodlight, Track Lighting, CCI Environmental Monitoring Kit* and *The Cleaning, Polishing and Protective Waxing of Brass and Copper Objects*. These one- to four-page leaflets provide simple, straightforward information. Within several years, a wide range of topics will be covered in this growing series. Copies are distributed free of charge through a special personal and institutional mailing list. To receive the periodic mailings, contact Publications Division, Canadian Conservation Institute, 1030 Innes Rd., Ottawa, Ont., K1A 0M8. Tel. (613) 998-3721.

CCI Technical Bulletins

CCI also published Technical Bulletins, obtainable at no charge from the above address. Five titles in this series are still in print: *Recommended Environmental Monitors for Museums, Archives and Art Galleries; Care of Musical Instruments in Canadian Collections; Environmental Norms for Canadian Museums, Art Galleries and Archives; Fluorescent Lamps;* and *The Care of Wooden Objects*. French versions of all CCI publications are available.

CMA Booksales Programme

The Canadian Museums Association's (CMA) Booksale Programme, administered by Capital Library Wholesale, offers a number of the most popular leaflet series. AASLH Technical Leaflets are sold for $1.25 each and a selection of *Museum News* Reprints may be purchased for the same price. The twelve Museum Data Bank Research Reports, which discuss computer use in museums, can be obtained for $1.25 each. CMA also sells several small manuals. Denis Alsford's *An Approach to Museum Security*, a CMA publication, is available for $2.00 ($1.75 for CMA members). Excellent small manuals from other publishing bodies include Kathleen Newcomb's *The Handbook for the Museum Store* ($10.25 for non-members, $8.25 for members) and M. Collins and L. Anderson's *Libraries for Small Museums* ($6.75 for non-members, $5.75 for members). A selection of French titles is offered, also at reduced prices for CMA members. Price list requests and orders should be addressed to Capital Library Wholesale Ltd., 1427 Ogilvie Rd., Ottawa, Ont., K1J 8M7. Tel. (613) 749-5949.

Grantsmanship Center *News* Reprints

The Grantsmanship Center, Los Angeles, sells reprints of articles from its magazine, The Grantsmanship Center *News*. Topics range from fundraising techniques to personnel management. Single copy prices run from $1.50 to $3.25. The reprints are also gathered into thematic packages: Basic Grantseeker Information ($18.50); Fundraising and Nongrant Support ($14.95); Finance and Management ($15.50); and Personnel Management ($12.50). A $1.50 handling charge is added to each order. Requests should be sent to The Grantsmanship Center *News*, 1031 S. Grant Ave., Los Angeles, Calif. 90015.

INPO Organizing Your Way to Dollars

The Institute for Nonprofit Organizations, a consulting firm with a special interest in fundraising, sells a series of pamphlets entitled Organizing Your Way to Dollars. Subjects include writing grant proposals, news releases, and fundraising letters; door-to-door fundraising; and fundraising and management. The eighteen issues in the series may be purchased individually or in a package for $23.50. Contact The Institute for Nonprofit Organizations, P.O. Box 1200, Station Q, Toronto, Ont., M4T 2P4. Tel. (705) 743-8124.

John Hilberry and Associates Checklists

John Hilberry and Associates, a Detroit architectural firm, sells two useful publications: *Museum Facilities Design Checklist* and *Museum Storage Design Checklist* ($.75 each). *Museum Collections Storage* by John Hilberry and Susan Kalb Weinberg, a *Museum News* Reprint, is available for $.50. Address inquiries to John Hilberry and Associates Inc., 1455 Center St., Detroit, Mich. 48226. Tel. (313) 963-8074.

Library of Congress Preservation Leaflets

The Library of Congress issues Preservation Leaflets. Two are still in print: *Preservation of Library Materials: First Sources* (no. 1) and *Newsprint and Its Preservation* (no. 5). These are distributed free of charge by the National Preservation Program Office, Library of Congress, Washington, D.C. 20540. Free publications on microfilming manuscripts, books, and pamphlets are available from the Library's Exchange and Gift Division. Other useful booklets are *Salvage of Water-Damaged Library Materials, Matting and Hinging Works of Art on Paper*, and *Polyester Film Encapsulation*, which range in price from $2.00 to $4.75. For these, contact the Superintendent of Documents, Dept. 39-LC, U.S. Government Printing Office, Washington, D.C. 20402.

Museums Association Information Sheets

The Museums Association (Great Britain) produces Information Sheets. Twelve of the twenty-five titles in the series are still in print. Subjects covered include sources for museological literature, control and measurement of relative humidity, museum lighting, mounting prints and drawings, museum storage, insurance, security, and museum shop management. Prices run from £.55 to £1.75. A £1.00 charge per sheet is added for airmail rates. For more information, write to the Museums Association, 34 Bloomsbury Way, London WC1A 2SF, Great Britain.

National Park Service Conserve O Grams

The Conserve O Gram series is produced by the National Park Service, U.S. Department of the Interior. Although the brief one- to two-page conservation publications (accompanied by a table of contents and a binder) are intended for park personnel, much of the material is applicable in museums. Correspondence should be addressed to Curatorial Services, Preservation Assistance Division, National Park Service

U.S. Department of the Interior, Washington, D.C. 20240.

MCC Museum Notes

The Museums Section of the Ontario Ministry of Citizenship and Culture issues the Museum Notes series. The six titles available to date are: *The Museum Board: Organization and Functions*, *Developing a Statement of Purpose for the Museum*, *Writing a Collections Management Policy for the Museum*, *Developing a Conservation Policy for the Museum*, *Museum Insurance*, and *Handling Museum Artifacts*. A bibliography entitled *Researching Historic Costumes for Reproduction*, of use to museums considering costuming their interpreters, has also been produced. Copies of these publications are distributed at no charge to the Ministry's client museums and are available on demand from Museums Advisors, History, Museums and Administration, Heritage Branch, Ministry of Citizenship and Culture, 77 Bloor St. W., 2nd Floor, Toronto, Ont., M7A 2R9. Tel. (416) 965-3937.

Other MCC Publications

Other divisions of the Ministry issue publications that have museum applications. Most notable are those of the Citizenship Branch. The Notes for Community Leaders series covers a number of topics related to community group activity, from planning and evaluation to publicity. Other useful booklets include *Getting People Together*, *Conference Planning*, and *Discussion Leaders' Handbook*. A recent, somewhat larger, manual is *Working with Volunteer Boards: A Facilitator's Handbook*. These publications and a number of similar ones may be purchased at the Ontario Government Bookstore, 880 Bay St., Toronto (hours: Mon.-Fri., 9:00-5:00). Written requests should be directed to the Publications Services Section, Central Purchasing Services Branch, Ministry of Government Services, 880 Bay St., 5th Floor, Toronto, Ont., M7A 1N8. Tel. (416) 965-6015 (toll free long distance: 1-800-268-7540; in northwestern Ontario: 0-Zenith-67200).

OHS Approaching Ontario's Past

The Ontario Historical Society's (OHS) Approaching Ontario's Past series, is aimed at the historical society audience, but some issues are of use to museums. Dorothy Duncan's *The Artifact: What Can It Tell Us About the Past?* (no. 4) and Robert M. Styran and Robert R. Taylor's *How to Produce Your Own Audiovisual Show* (no. 5) may be purchased for $1.00 each (and $.75 handling). Contact The Ontario Historical Society, 78 Dunloe Rd., Toronto, Ont., M5P 2T6. Tel. (416) 486-1232.

RCHA Technical Information Sheets

The Regional Conference of Historical Agencies (RCHA) issues Technical Information Sheets, which deal with various aspects of museum work. These two- or four-page leaflets are distributed as inserts in the RCHA newsletter. Copies of the information sheets cost $.50 and may be obtained from the Regional Conference of Historical Agencies, 314 E. Seneca St., Manlius, NY 13104. Tel. (315) 682-7088.

Sotheby Parke Bernet Publications

Sotheby Parke Bernet has two free publications: Mary Todd Glaser's *Framing and Preservation of Works of Art on Paper* and Doris Bry's *An Approach to the Care of Photographs*. The former is available from the Print Department, the latter from the Photographs Department. Address inquiries to Sotheby Parke Bernet, Dept. AH, 1425 York Ave., New York, NY 10021.

Other Items of Interest

Numerous free or inexpensive publications not intended specifically for museum audiences can nonetheless have strong applications. Small business management literature is a prime example of material that can be used by community museum administrators. The U.S. Small Business Administration, P.O. Box 15434, Fort Worth, TX 76119, issues a free series entitled Management Aids, which recommends methods for handling administrative problems and techniques for effective business management. Small Business Bibliographies, another series produced by the same organization, lists key reference sources on many private sector management topics.

Most of the technical leaflet series listed above should be held in the collections of major museological resource centres. Some of these institutions offer inter-library loans, which are particularly valuable for museums located away from major urban areas.

Anita Rush is a student in the Museum Studies Program, University of Toronto.

Safeguarding Museum Collections: A Review of Handling

Joyce Lister

When we contemplate a museum object's physical environment, we consider its storage or gallery location and climatic, light, and pollutant levels. One fundamental aspect of that environment — the physical handling of the object is often overlooked. Museum personnel, improperly trained or negligent in their handling techniques, are as harmful as fluctuating temperature and humidity in contributing to artifact and specimen deterioration.

Proper handling is essential for the preservation of museum objects. It is cultivated by a professional attitude that promotes the safety of the object. A safe handling environment for museum objects can be achieved in two ways: firstly, the museum must periodically provide orientation and training programs for staff — new and old, from volunteer to curator — who are part of an object's environment through physical contact with the object; and secondly, staff must exhibit personal initiative through self and group scrutiny to assess, improve, implement, and reinforce safe handling practices.

Recent museological literature on handling procedures has established a groundwork of rules and principles. The application of these rules along with common sense will aid in solving the particular problems that each object poses. Prior to a discussion of specific museum objects and handling procedures, general handling rules will be considered.

General Handling Procedures

Handle museum objects as infrequently and as briefly as possible. Once items like costumes, jewellery, weaponry and musical instruments enter the museum's collections, they lose their functional purpose. Plan and label collection storage areas in such a way that an object can be easily located and removed with little or no disturbance to the remaining collection.

Care in handling should not be influenced by the object's museological or monetary value. Each object — artifact or scientific specimen — is invaluable. A sympathetic environment is created when the handler acquaints himself or herself with the object's structural nature, past history, and current condition before the object is handled.

Everything that touches the object, from gloves and cushioning materials to the slippers worn in carpeted period rooms, must be clean. No smoking, food, drink, sharp objects, or marking implements, other than a lead pencil, should be allowed within the vicinity of the artifacts and specimens. Jewellery and watches must be removed before handling objects because they can snag and scratch surfaces. The contents of breast pockets should be emptied before one bends over to lift an object.

Use both hands when carrying objects and handle only one object at a time regardless of the object's size. If an object consists of more than one piece, handle the pieces separately in order to reduce self abrasion and the chance of a faulty grip. Do not carry an object by its handles, rim, or any other projecting part because these areas are vulnerable and may be the sites of earlier damage. Always lift and never push or drag an object even if the object has rollers or castors.

Soft, white cotton gloves (clean and dry) should be worn most of the time. However, if an object's surface is fragile or slippery, plastic surgeon's gloves or tissue paper may be preferred. Cotton gloves may reduce the handler's sensitivity and may snag on the object's decorative elements.

In some situations, disposable plastic gloves should be worn to protect personal health. Potential dangers from contact include handling fumigated materials, medicines and medical equipment, poisonous arrow tips, and old taxidermy specimens that may have been preserved with arsenic.

If an artifact or specimen is damaged while being handled, the circumstances surrounding the incident should be recorded and any detached pieces carefully collected and identified. This information should be forwarded to qualified personnel for advice on proper procedures for repair. Never alter an object (e.g., dismantle, clean, or repair) without expert advice.

Avoid haste in handling and moving. Never walk backwards in the vicinity of museum objects. If more than one person is required to handle an object, discuss and co-ordinate a plan of action, stipulating the role of each worker and the equipment to be used. Clear the intended route and prepare the receiving area before moving the object.

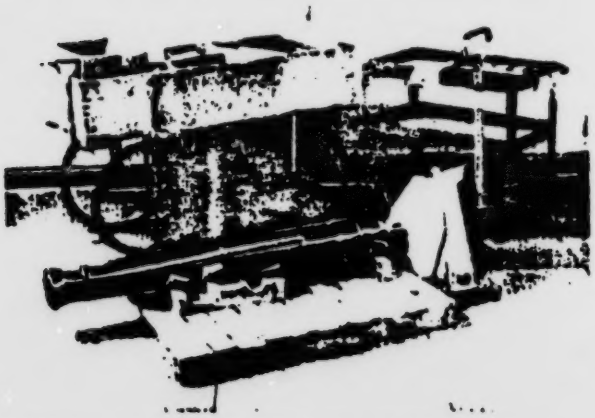

Figure 1. Bicycle buggy, multi level cart, and pallet lifter with forks under pallet and heavy cannon. Photo by: Brian Boyle

The transportation of objects within the museum entails risks. The chances of mishandling are greatly reduced by using moving devices suited to the physical requirements of the object. Even though it may be possible to lift an object unassisted, it is not always advisable to do so. In many cases, transporters eliminate what would otherwise have been improper handling. Transporters, such as multi-level carts, dollies, flatbeds, and pallet lifters, are useful and practical labour-saving devices. Transportation equipment should be well maintained and properly prepared to accommodate the object (e.g., padded with furniture blankets, bubblepak, or foam rubber pads). With a little imagination, transporters such as the dollie with the removable insert, can be adapted, or designed for particular needs. The illustrated "bicycle buggy," (see figure 1) equipped with ordinary bicycle wheels, gives a smooth ride, an excellent deep carriage, and a lockable built-in unit for housing tools and paperwork away from objects. Many moving devices can be easily constructed. Smaller museums might consider approaching local clubs to assist in designing and fabricating moving equipment. As the number of motions is reduced in moving an object, so is the risk of damage. Therefore, take the moving device to the object, not the object to the device.

When placing artifacts or specimens on, or in, a mobile device, container, or carrying tray, museum staff should take care not to overload or overextend the edges of the carrier. Safely separate, cushion, and secure every item so the objects can not shift in transit. This includes standing an object on its most stable surface (e.g., inverting a teacup). Do not mix materials of different weights or sizes. Unanticipated movement could cause crushing. Packing materials should be thoroughly searched before being discarded in case they conceal a detached or separate piece of an object.

Ceramics, Glass, and Stone

In order to avoid slippage and fingerprints on porous materials, such as marble, alabaster, and unglazed pottery, plastic surgeon's gloves should be worn. If several pieces are moved at one time, the container or mobile device should be carefully padded, but not so deeply cushioned that the objects cannot stand firm. Cotton batting should be used for most pieces, unless the objects have a rough or delicate surface. Cotton tends to cling to rough areas and is tedious and difficult to remove. Wrap delicate objects in clean tissue paper before packing.

Extremely fragile objects, such as ancient glass, should be hand-carried to avoid vibrations that may be transmitted by the moving device. Direct contact between the handler and the object should be avoided. Gloves should be worn. One hand should support the bottom of the object and the other hand should steady the object at the side or on the top.

Furniture

Never push or drag a piece of furniture across the floor. Lift and carry, or prepare a mobile device. When lifting, use the solid part of the object's framework (e.g., the seat of a chair), not projecting or ornamental parts. Unless advised otherwise, furniture should be kept in an upright position. To prevent accidents, removable elements, such as marble tops, and finials, should be transported separately from the main object and given the same amount of handling attention. Removing these, as well as drawers, reduces the total weight of the piece, making it easier to handle. Decorative elements that cannot be removed should be padded and wrapped in corrugated cardboard. To prevent movement and possible damage in transit, tie unlocked drawers, doors, and loose or hinged parts with twill tape, which will not

abrade the surface finish. Pad hanging drawer or door pulls to protect the surface behind them. Protect the upholstered areas of furniture from handling with a tie-on covering of clean, white cotton cloth or acid-free tissue.

Jewellery and Metals

Before handling, examine jewellery to ensure that the beads are securely threaded, that stones are not loose in their settings, and that clasps are fastened. Prior to padding jewellery in cotton, wrap it in acid-free tissue to prevent cotton particles from entering gem settings or concealing a lost stone. Metal objects should never come in contact with bare hands because the salt residue from perspiration causes damage. In most instances, cotton gloves will suffice except when the surface of the object is slippery or the metal is severely corroded. In those cases, plastic gloves are recommended.

Never use cotton gloves when handling jewellery. The grasp is not secure enough for such small objects and threads from gloves may cause breakage or loosening of parts. Wrap each piece of jewellery separately, even if it is part of a set. Matching pieces should be kept together but not allowed to touch each other. Pinning certain pieces of jewellery to velvet-covered boards with noncorrosive T-shaped pins will ensure safety during movement.

Paintings

Never touch or apply pressure of any kind to the front or back of a painting. Paintings should be carried vertically, unless there is loose, flaking paint. Under those circumstances, they should be carried in a horizontal position, paint side up. The painting, glazed or unglazed, should always face the handler, preventing the glass or painted surface from contacting walls or projections. Be aware that buttons on clothing may abrade the surface of a painting. Carry the painting at a safe and comfortable distance. Only one painting should be carried at a time.

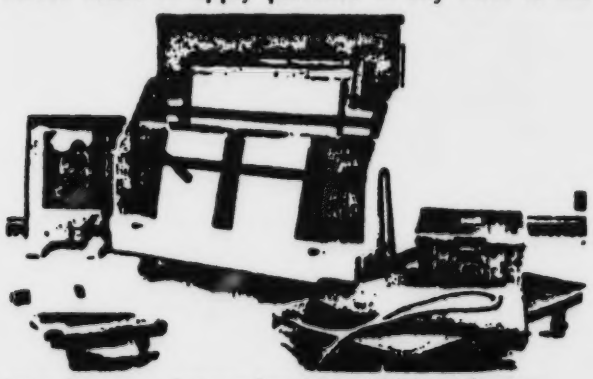

Figure 2: (counter clockwise from left to right) framed picture supported on blocks, dollie and insert, loaded painting carrier, plastic container and furniture blanket atop a flatbed. Photo by: Brian Bowle, Royal Ontario Museum

Wear gloves to protect polished or gilded surfaces of frames. Before handling a painting, make sure that it is secure in its frame. Never carry a framed painting by its top or by one side, regardless of its condition. Carry frames vertically with one hand at the bottom for support and one hand at a side member, balancing it. Keep hands away from the carving of an ornate frame, which can be delicate and fragile.

When storing a painting, never set its frame on a corner. Set it down straight on padded blocks with a non-skid base. Put the painting's weight on the support, not on the carving of the frame. In the case of aluminum frames, keep the stacks to a maximum of five paintings. Stand the largest work against the wall in as vertical a position as possible. All succeeding works should be arranged in order of decreasing size, with separators in between.

Do not carry an unframed painting by its top or any one side of the stretcher frame (i.e., the wooden structure to which the canvas is attached). Support the painting from beneath, carrying it by the wooden stretcher only. Do not stack unframed paintings.

If a painting is large enough for two persons to handle, each person should have one hand at a bottom corner and the other hand at one side and towards the top corner. When carrying a very tall painting, the handler at each end should hold the side only. Lifting from underneath could raise the centre of gravity and cause the painting to topple.

Painting carriers should be at least two-thirds the height of the largest painting on the truck. The bottom shelf and the centre divider of the illustrated carrier (see figure 2) are carpeted for cushioning. A lip and straps have been provided to prevent paintings from sliding or falling off the carrier. Two people should accompany any loaded moving device, one to maneuver the device and the other to oversee the contents and open doors.

Paper and Books

Gloves should always be worn when handling paper and books. Leather bindings stain easily. Matted works of art on paper should be handled only by the matt. The matts should be kept flat and face up. A piece of acid-free tissue can be slipped between the aperture and the work of art. Matted works of art should be piled only if they are of similar size. The largest should be at the bottom of the pile and the smallest at the top. Piles should be shallow.

An unmatted work should be moved by slipping a piece of acid-free matting board below it and carrying it flat and face up. If the piece has to be car-

ried over any distance, it can be wrapped in acid-free tissue and sandwiched between two pieces of acid-free board. If stacking of unmatted works is unavoidable, sheets of folded acid-free tissue can be used as separators. Piles should be shallow and should not be maintained for a long period of time. To locate an object in a pile, search by creating a new pile. Do not thumb through an existing pile.

Delicately-attached media, such as charcoal, chalk, and pastels, are extremely vulnerable. Their surfaces should never be touched. They should be protected from vibration, air currents, and dust, and should be transported individually in solander boxes.

Lift books off shelves. Do not remove a book from the shelf by pulling the top of its spine and dragging the bottom of the book over the edge of the shelf. Do not crack the bindings. Fragile or unstable books should be wrapped in acid-free tissue and given the additional support of acid-free mattboard as a stiffener. Opened books should not be stacked, left open for long periods of time, or placed face down. When reading a book, turn the pages by the upper, outer corners with clean, dry fingers.

Sculpture

Objects like sculpture, which can be large as well as heavy, should be moved on a transporter that has been properly prepared. If the object cannot be held in place with padded blocks or wedges, lash the object to the device, using adequate padding between the ropes and the object's surface.

Do not use excessive padding on the transporter. Unequal pressure can be created within the object, causing breakage by the object's own weight.

Move sculpture in its most stable position. Use discretion. Even though the object may be top heavy, it could be damaged if laid flat or inverted.

The moving of large objects is a technical problem and should be undertaken only with competent direction and assistance. The safety of the object and of the handler are at risk.

Textiles

Clean hands are essential. Plastic surgeon's gloves should be worn in the presence of metal beads, sequins, or other attachments that can snag on a cotton glove. All pins should be removed to prevent rust stains, as well as possible blood stains from scratched fingers. Ideally, textiles should not be folded. If folding is unavoidable, several layers of crumpled, acid-free tissue should be placed in the inner part of the fold. Try to avoid folding along old folds. As a general rule, try not to let fabric touch fabric. Folded or rolled textiles should not be piled.

Small, flat textiles should be transported in a box, on a tray, or on a sheet of firm material. Flat pieces that are too large to remain flat should be rolled around a relatively large diameter cylinder that has been wrapped first with plastic sheeting and then with acid-free paper. This step will reduce acid migration from a cylinder that is not acid-free. The textile should be rolled right side out, rolling acid-free tissue in with the piece so that the material will not roll onto itself. Be careful not to crease the textile as it is rolled. After an outer wrap is applied, the tube should be tied loosely with twill tape. The tube should be longer than the rolled textile to prevent the edges of the textile from becoming soiled or damaged from contact with other objects or from handling. Rolled textiles should be carried by the outer ends of the tube, with one person at each end.

If a costume mounted on a mannequin is to be moved, lift the mannequin by its framework, not by the costume. Cover the costume with clean, white cotton sheeting before moving the mannequin.

Museum staff, through physical contact, form an integral part of an artifact's or specimen's environment. The preservation of museum objects for the study and enjoyment of future generations is a staff responsibility. It is recommended that museums recognize this by ensuring that staff thoroughly understand how to handle museum collections with care.

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* Available from
Provincial Museum of Alberta
Bookstore
12845 - 102 Avenue
Edmonton, Alberta, T5N 0M6
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PART I: JUST ON GENERAL PRINCIPLES

Proper care in the storage of a collection is just as important as care in its display. Unfortunately, the storage area is often not given as much thought, time, or budget as the exhibition hall, resulting in the deterioration of many objects. This is unnecessary, because with a bit of planning, even small institutions with limited resources can make effective use of what space is available.

The three major considerations in the organization of any storage area are packaging, shelving and environmental control. Each type of artifact has inherent storage problems according to its composition, condition, and size. These will be discussed in Part II; however, some general principles should be mentioned to start.

CLEANING

Before being placed in storage, all artifacts must be clean, and free of insects and mould, to prevent damage to the object itself and contamination of the rest of the collection. This cleaning consists primarily of removing dust and loose dirt; vacuuming will do this very nicely. Soft, fibreglass screening or nylon net should be held gently on objects during vacuuming to prevent pulling off loose pieces or fragile threads. Objects with loose paint, flaking surfaces, loose beads or buttons can be carefully dusted with a photographer's blower brush. Resist the temptation to blow the dust off of an object; breath moisture will cause dust to stick, and saliva particles can be chemically damaging, as well as nourishing to infestations.

Active insect infestations require fumigation, and for this an expert should be consulted immediately. Until the invaders can be dealt with, keep contaminated objects in quarantine by enclosing them in multiple layers of heavy garbage bags. A Vapona Strip may be enclosed as long as it does not touch the object. It may corrode metals, so monitor weekly. Do not put infested material in with the rest of the collection.

Mould is controlled by regulating the temperature and relative humidity: moulds will not usually grow in well-ventilated areas where the RH is less than 60%. Mouldy or mildewed objects should be gently brushed and vacuumed (away from uncontaminated objects) to eliminate spores, and kept dry until expert advice can be obtained. Mould breakouts on walls, ceilings or floors of storage areas can be treated by spraying with Lysol spray (not Lysol liquid) and wiping the walls thoroughly. Use disposable wipers to avoid recontaminating cleaned areas with spore-laden cloths.

The "airing" of objects is not normally a good idea. No artifact should be exposed outdoors or to bright sunlight. This is especially important for light sensitive materials such as textiles, paintings or works of art on paper. Apart from attracting more airborne dirt and insects, light is the major cause of fading and embrittlement of organic objects (see Organics).

PACKAGING

Once cleaned, artifacts should be wrapped or covered to protect them from light, dust, and atmospheric pollution.

Where humidity is a problem, or where the fire-fighting equipment includes water sprinklers, artifacts should also be protected against condensation and accidental leaks.

Liquid condensation within containers or packages can be prevented either by ensuring that air can pass freely in and out of the container or bag, or by wrapping the object in a moisture-absorbant material such as acid-free tissue paper or washed cotton sheeting, before placing the object in the outside container or plastic wrapping. Small packets of the dessicant silica gel, which absorbs atmospheric moisture, can be included in a closed package, but be sure they are not in direct contact with the object (see Part III). This is especially recommended for metals.

Large objects such as furniture or equipment should be covered with thin Tyvek, or with an old, well-washed cotton sheet under a layer of polyethylene, to protect against leaks.

Custom-tailored dust covers can be made by heat-sealing polyethylene sheeting, but an industrial-quality sealer will be needed.

Protective coverings, whether water-proof or not, should be made of acid-free or acid-neutral materials.

Acidity is described by the pH scale of 1 to 14: neutral pH is 7.0; anything higher is alkaline, and a lower number is acidic. "Acid-free" materials have been washed free of acids to a reading of pH 7.0. Some cardboards may have alkaline substances added to protect against acidity from the environment: these are usually termed "acid-buffered".

"Acid-neutral" materials do not contain free acids or bases. Examples of these are polyethylene and Mylar films and Archival-quality self-adhesive tapes. It should be remembered that the main problem with sticky tapes is not acidity, but the adhesive, which sinks into paper or other porous material, becomes insoluble and yellow, and is almost impossible to remove.

Preferred storage materials are cardboard, tissue papers, (preferably acid-free), washed unbleached cotton muslin (light weight), Mylar or polyethylene plastic sheeting or polyethylene bags, and polyethylene foams. Please note that polyethylene sheeting must not be left in direct contact with an artifact: a layer of cloth or tissue paper must be between the plastic and the object. All wooden surfaces should have at least two coats of shellac, and if acid-free cardboard boxes are not obtainable, ordinary cardboard can be lined with aluminum foil or polyethylene sheeting.

Small, easily lost or fragile objects should be packed in rigid containers. There is a variety of containers on the market which are suitable for the storage of artifacts: polyethylene boxes and jars, acid-free library storage boxes, or glass pill bottles for small objects. Be sure plastic containers are made of polyethylene, polypropylene, or (less desirable) polystyrene. Oozing plasticizers from other plastic materials can damage objects, and the chlorides in polyvinyl chloride can corrode metals and destroy photographic emulsions.

SHELVING

Shelves, drawers, and cupboards can range in price and materials from expensive all-metal custom-mades, to inexpensive scrap lumber home-mades. Regardless of material chosen, there are some basic rules to be considered. The shelving units or cupboards must be steady; aside from the danger of falling over, damage can occur from the vibrations caused by someone walking past an unstable unit. Storage units should not be installed directly against an outside wall, but four to six inches away, to allow free air circulation and prevent moisture condensation. For the same reason, and in case of flooding, shelves and boxes should be raised up off the floor three to six inches. Used wooden skids or pallets can be used under cabinets. The shelves or drawers should be wide and deep enough to accomodate large objects without having them protrude over the edges, but they should be shallow enough to avoid the temptation of storing too many things together.

Aftifacts must not be jostled together or piled on top of each other. Scratching, chipping, creasing, and breakage always result from over-crowding. Documents, photographs, work tools, and other miscellany should not be stored with artifacts.

Open shelving should have top to bottom covers against dust and light, of washed cotton or polyethylene. Velcro side fastenings and a dowel weight at the bottom make these easier to handle.

Air moisture can condense into water droplets on cold metal (for example during a power failure), so bare metal shelves and drawers should have an absorbant liner to keep moisture away from the objects. Drawers are useful for storing small items because they keep out dust and light, but they should be padded and subdivided to keep things from rolling around. Acceptable liners could be Cellu-foam or Micro-foam sheet, lab-bench soakers with the plastic side in contact with the metal, acid-free board or paper, or acid-free paper towels. Acidic brown cardboard box trays are not recommended except as a last resort. See Part III for descriptions of these materials.

Wooden drawers and shelves release organic acids which are damaging to many artifacts.

Wood surfaces should be sealed with at least two coats of alcohol-shellac solution, and allowed to air dry until there is no detectable odor. Avoid Varathane and other varnishes as these may stimulate metal corrosion under certain conditions. Ensure that all surfaces are coated. If, for some reason, it is not possible to seal the wood, drawers and shelves should be lined with Mylar Type D film, aluminum foil, or polyethylene film.

Plastic storage units may have a dust attraction problem, due to static electricity; also, not all plastic is chemically inert. Protecting objects with appropriate wrappings will help to control damage by dust and transmission of undesirable substances from wood and plastic.

However well wrapped, any object will deteriorate if problems are allowed to go unchecked. Rodents can chew through any sort of covering or container, and insects can slip through even the best of air-conditioning systems and head straight for the food: your collection. Pests are especially attracted by fresh food residues, so eating and drinking should not be permitted in collection areas.

It is essential that all storage areas and artifacts be checked at frequent and regular intervals for dust accumulation, rodent and insect infestations, mould growth, leakages, and dangerous rises or fluctuations in the temperature and humidity. The sooner potential causes of damage are discovered, the sooner they can be corrected and damage averted. For a collection housed in an old, converted, or uncontrolled building, inspection once a week is not too often.

ENVIRONMENT

Inappropriate levels of temperature and humidity, and repeated fluctions of humidity, cause great damage to collection materials. Wood, leather, paper and textiles shrink and become brittle, and can even rip spontaneously at low humidities; metals corrode and moulds grow at high humidities. Even glass, stone, and mineral specimens can react to changes in humidity.

The special needs of individual materials are discussed in Part II, and in the Bulletin "Environmental Norms for Canadian Museums", available free from The Canadian Conservation Institute.

Few museums can afford expensive air handling systems to control their environment, but every institution can monitor to determine what conditions exist, and take steps to minimize fluctuations. The inclusion of large amounts of organic materials, such as cloth or paper for wrappings, is one these steps: these natural fibres are known as "humidity buffering" materials, because of their ability to absorb excess humidity and re-release it slowly. This slows the rate of fluctuations, and helps to minimize damage.

Some museums and galleries lower the temperature at night as an economy measure. This will cause the humidity to rise at night, and drop suddenly when heat is turned on in the morning. If the temperature falls low enough, the humidity "dewpoint" will be reached, which may result in condensation, mould growth, staining, and corrosion of metals. Therefore, in addition to the visual inspection, a check should be made of the temperature and humidity of key areas on a daily basis, at the same time each day.

MONITORING

The best way to find out what environmental conditions exist in your museum is to use a recording hygrothermograph. This is a highly accurate device (when properly calibrated) which constantly measures the exact temperature and relative humidity levels, and records them on a paper chart, on a weekly or monthly basis.

This instrument is, unfortunately, expensive, but is available on loan from the Executive Director, Museums Services, Alberta Culture, or from the Canadian Conservation Institute in Ottawa. Do borrow one in the summer, and again in the winter, and use it to check for a couple of weeks in each of your major areas. The resulting charts will alert you to fluctuations over the 24 hour cycle which you might miss by taking only one reading a day or week.

The next best method is to make your own written record (graph form is the most informative), using a psychrometer for measurement. We emphasize that readings must be taken at the same time every day (try both morning and afternoon to start and you will notice the difference) so that comparisons can be made and any potential trouble averted.

The battery-operated Bendix "Psychron" is recommended in spite of its cost, because it gives the best accuracy and consistency of results, provided you calculate the relative humidity from the charts supplied, and not from the slide rule. Hand-whirled "sling" psychrometers are much less expensive, but readings can vary according to the speeds and length of time you whirl. Have the calibration of the thermometers checked at your local college.

A liquid crystal strip which shows both temperature and relative humidity (the covey thermo-hygrometer) is attractive enough for inclusion in display cases, but legibility depends on the angle at which light falls on it. It is helpful to make it a swivel-mount to make it easy to read from outside the case.

Small, inexpensive dial-type thermohygrometers (such as those available at hardware stores) are not usually very accurate, but they do measure the temperature and relative humidity, and provide information at a glance. Keep a written log of these readings too, in order to be aware of changes.

As an interim approach, when budgets are severely limited, humidity indicator cards are available. These have a pink/blue scale for the measurement of relative humidity. There are also thermopapers, which are heat-sensitive-chemical impregnated paper strips, which change colour when a certain temperature is reached. Thermopapers are primarily useful in areas you cannot visit frequently, but suspect may have high temperatures (like warehouses). Both of these are slow to react and give only approximate readings.

Light and ultraviolet radiation cause photochemical damage to organic materials. They are measured with special meters, which are described in Part III. The CCI Bulletins "Museum Lighting" and "Fluorescent Lamps" are recommended reading.

HANDLING

Improper handling is probably the greatest single cause of damage to museum artifacts. Objects should be handled as little as possible, and with bare hands only if the object is slippery. Natural skin oils, salts and moisture are replaced within minutes after washing the hands, and when transferred to an object attract dust and mould spores, cause stains, and etch metals. Please wear gloves.

LABELLING

All boxes, jars, shelves, cupboards and drawers must be clearly labelled as to contents. Shelf lists and labels make it easier to find a specific item and reduce unnecessary handling. The use of clear plastic boxes with lids (such as those meant for storing shoes and handbags), while not entirely inert, do enable the contents to be seen. Photographs of contents can be mounted on the front of non-transparent containers. Labels made of polyethylene paper (Tyvek) are ideal, because they can be written on with ordinary pens, pencils, or waterproof markers, and will not dissolve, tear, run if accidentally dampened, or be attacked by insects or mould. Dymo labels may be useful but require a machine to print out, which is time consuming, and tend to fall off. There is a variety of paper labels available which can be attached to an object with string; these are not acid-free and are not resistant to damp. Metal rimmed tags can rust, and spot textiles.

PART II: TO EACH ITS OWN

Artifacts can be divided into three main groups: organics, inorganics, and composites, according to their physical composition. Each of these can be subdivided into smaller groups, all of which have their own intrinsic storage problems.

Ideal environmental storage conditions for organic materials would be 68°F and 55-60% RH, but this will cause corrosion of metals. The recommended level of 68°F and less than 30% RH for inorganics is much too dry for any organics in a collection. It is possible to create zoned areas for separate storage of organics and inorganics, but except for special problem objects, a compromise temperature and humidity of 68°F and 45-50% RH can be used for convenience of total collection management. Unfortunately, it is nearly impossible to maintain 45% RH in the winter in Alberta unless your building is specially designed to do so safely. We therefore recommend 68°F and 30% RH for the winter and 72°F and 55% maximum for the summer, with the changeover controlled to a rate of no more than 10% per month.

It is best to consult a conservator to determine whether special conditions may be required in your collection, and how best to achieve them.

ORGANICS

These artifacts are made of animal or vegetable materials which were once living. They are extremely sensitive to pollution, light, heat, excessive dryness, prolonged damp, and sudden changes in environment. They are susceptible to attack by rodents, insects, and mildew, and are often physically fragile and easily damaged by handling. In the wrong environment, leathers and skins, textiles and documents, can either mould and rot, or become hard, warped and brittle. All organic materials are especially light sensitive and should not be displayed at light levels exceeding 50 lux. Silk, for example, can lose half its strength in one month's exposure to direct sunlight.

Organic objects ideally should be stored in a completely dark room, but where this is not possible, should be covered and protected from light. Windows can be shuttered or curtained, or even boarded or dry-walled over. Unnecessary fluorescent tubes can be removed from fixtures to bring light levels down below 50 lux. Shielding is available for windows and fluorescent light fixtures which will minimize ultraviolet rays.

As well as needing protection from light, organic objects must be covered to prevent dust accumulation. These coverings and wrappings must not be air-tight: free air circulation is essential to prevent mould growth.

Natural History Specimens

These are especially prone to environmental damage. They are a prime food source for many insects, and are highly susceptible to mould. Fur, feathers, and botanical specimens are exceptionally light-sensitive, and the fading damage is irreversible. Specimens are also very fragile; even large mounted animals can be damaged by careless handling. Horns and antlers can chip,and hides can tear. Preserved flowers are weakened by acidic mounting materials. Natural History specimens should therefore be stored in a stable environment on padded shelves or drawers, protected from light and dust.

Although they are inorganic, mineral specimens are as fragile and sensitive to humidity fluctuations as are organic materials. Consult a mineralogist for the appropriate humidity levels for your specimens.

Textiles

This term is used to describe all articles made out of fabric: clothing, rugs, wall hangings, and upholstery.

Before storing, textiles should be cleaned by vacuuming and washing or dry-cleaning. Contact the Textile Analysis Service at the University of Alberta for advice.

Flat items, if small, can be laid unfolded in drawers, interleaved with sheets of tissue paper.

An alternative storage and display method for small flat textiles is to mount them between sheets of fine silk or polyester chiffon in an acid-free mount board "frame-book". For further details on this method, please contact a conservator at the University of Alberta Textile Service, the Glenbow Museum, or the Provincial Museum of Alberta.

Large textiles, such as quilts or floor rugs, can be rolled with a layer of tissue paper around a large-diameter cardboard tube which is either acid-free or which has first been covered with Mylar film and acid-free tissue, unbleached cotton, or cotton surgical stockinette. A dust cover of acid-free tissue paper, or unbleached cotton cloth is wrapped around the tube and tied on with cotton twill tape. The roll is then supported in a horizontal position from a wall or ceiling rack. The entire rack should have a loose cover of polyethylene against ceiling leaks.

Articles of clothing should have as few folds as possible. If lack of space prohibits the use of padded mannikins, clothes should have sleeves, legs, and any folded areas lightly stuffed with acid-free tissue paper to prevent creases, and should be wrapped in tissue paper and placed in acid-free cardboard boxes or in lined drawers. Fragile items can be placed in small boxes which have been padded with cellufoam or microfoam (not "sponge rubber").

If garments have to be hung at any time, make sure that the hangers have 1 1/2 to 2 inches of secured padding, made to fit the dimensions of the garment, out of polyethylene foam or small-bubble pack, or polyester quilt batting covered with washed cotton,. Washed cotton dust covers are essential for hung storage.

Textiles which have been framed are best stored in the same manner as paintings, covered against dust.

Hats should never be piled on top of each other. The crown should be well stuffed with crumpled acid-free tissue paper before the hat is placed on a clean shelf liner. Shaped brims should be supported with strategically placed crumpled tissue to prevent sagging. Tissue will eventually slump, so inspect every few months. Details of a bean-bag method which is longer lasting are available from the Conservation Program of the Provincial Museum.

Leather

Three main types of leather are found in collections in Alberta: commercially tanned leather ranging from kid gloves to horse collars; Indian tanned leather, or buckskin; and rawhide or parchment.

All require the same protection from light, dust, heat and humidity fluctuations as textiles, and require similar special supports.

Items stored flat should be stuffed with acid-free tissue to prevent shape loss, and to prevent folds from causing fibre breakage.

Items which were traditionally hung for storage (such as horse collars) should be carefully examined to determine if they are still strong enough (probably not), and hung only on well-padded supports.

Rawhide and parchment frequently split in the dry season because they are usually fastened at the edges and cannot shrink without tearing. If these objects cannot be loosened for the winter, wrap them at the end of August (when it is still damp) in several layers of terry cloth, and then loosely in a garbage bag. You must check occasionally for mould, but this may help to prevent splits and tears, which cannot be satisfactorily repaired. Unwrap them in May.

Request the CCI notes on leather for information about cleaning.

Beadwork

Although artifacts with beadwork are actually composite articles of leather, cloth, cotton or sinew, and glass, they may be treated as outlined above, padding well to support the weight of the beads.

Dirty beadwork may be cleaned by brushing with a dry small, stiff brush such as the type used to clear electric razors. Do not use water or solvents on leather or beadwork.

Some trade beads may have been made of unstable glass formulations which will crack spontaneously in fluctuating relative humidities. Consult a conservator quickly if you notice this happening.

Paper

Books, documents, and works of art on paper, are all highly susceptible to chemical decay, due to the nature of the paper itself. Most common types of paper, especially newsprint, are treated with

chemicals in the process of making them, and these are left in the finished product as residues which then slowly destroy the cellulose fibres. This results in yellowing, fading and embrittlement. Additional acids from air pollution, or acidic mounts or folders accelerate the rate of decay. The deacidification of documents must be done by a conservator trained in this technique, but much can be done to halt or slow down deterioration.

Documents and art on paper should be stored in the dark, and viewed by as little light as possible. They should be laid fat, unfolded, and interleaved with sheets of acid-free paper, or in acid-free folders. Prints and drawings may be stored in acid-free mats. Map drawers are excellent for storage; file cabinets should not be used as documents tend to slump if they are stored vertically. Clapp's book, "Curatoral Care of Works of Art on Paper" is an invaluable resource on storage, care and matting and framing. Additional reprint material is available from The Conservation Program at The Provincial Museum, especially on matting and framing.

When air pollution is a serious problem, as it may be in the neighbourhood of gas wells, additional protection can be afforded by storing interleaved papers in archival solander boxes. This also allows storage on shelves. You can also make your own document storage boxes of Coroplast, preferably liing them with Permalife paper, which has been manufactured with an alkaline buffer against acidity.

No sticky tape of any sort must come in contact with any document at any time. Pressure-sensitive (sticky) tape adhesives ooze into the paper, causing staining which may be impossible to remove. If papers require repair, or are to be handled frequently, seek professional advice.

If books are to be stored in boxes, or are not referred to frequently, they can be wrapped in acid-free paper. If they are stored on shelves, they should not be allowed to slump over onto one cover, as this will distort the covers, crack the bindings, and break the edges off of brittle pages. Books with broken bindings should be wrapped in acid-free or polyethylene paper, tied in place with cotton twill tape. All library materials must be kept dusted and vacuumed, and those which are stored in boxes must be checked regularly for damp and insects, such as silverfish, which feed on paper size and binding glue.

The monitoring of temperature and relative humidity has been discussed above, but the acid content of documents and books may also be monitored. There are two simple ways to do this. The most common is by using an archivist's pen, which is a writing pen designed to hold a special ink. This ink is acid-sensitive, turning yellow when the pH dips below 3.6, blue when it rises to 5.2 or higher, and green in between. It cannot be removed once applied. The convention for books is to place a small dot in the second zero of the page 100 number : 100, or on the back corner of a document, where it can be checked visually at regular intervals. The major drawback to the archivist's pen is that pH 5 is already excessively acidic, so a blue dot will not tell you that your paper is safe, but a green dot will tell you that you should call a conservator.

The other methods of measuring acid levels are with either a pH meter, or with pH indicator strips. Both of these have a wider range than archivist's pens, but a meter requires a special electrode, or that the paper be ground to pulp in solution. The strips require that the area tested by thoroughly wet, and the strip be held tightly in contact for some minutes. As well, the indicator colours of some types of pH papers may run.

INORGANICS

Inorganic objects are those of mineral origin: glass, ceramic, stone and metal. Generally they are more stable than the organics and composites, but they do have their own problems with deterioration. They are not excessively affected by light, dryness, rodents, insects, or mould, but may react to heat, pollution, dust, prolonged damp (especially metals) and fluctuating humidity.

Glass

The chief damage to watch for with glass is breakage. It is wise to put a soft runner on the floor where glass is stored "just in case". Avoid rubber-backed carpet because of sulphur fumes. Glass may be wrapped and padded with soft tissue paper, such as Litho-wipes, and placed in rigid boxes, or placed on dust-covered open shelving which has

been padded with a very thin layer of polyethylene foam.

Before storing, dust and dirt can be removed by gentle washing in lukewarm (never hot) de-ionized or distilled water and anionic detergent ("Orvus"; do not use commercial detergents), followed by thorough rinsing in plain lukewarm distilled or de-ionized water. Allow to dry thoroughly before packing away.

Items with flaking patina (irridescence) or paint should not be washed or wrapped. They require special storage: a conservator's advice is recommended.

Some glasses may have unstable formulations which react to fluctuations in relative humidity, causing them to "weep" or crack spontaneously. Some ethnographic glass beads show this cracking or a whitish surface deposit. An absolutely stable environment is essential to save these: call a conservator without delay.

Ceramic

Ceramic comes in a variety of forms and textures, from highly-fired vitreous porcelain to low-fired porous earthware. Porcelain and glazed earthenware can be treated as glass. If washing unglazed ware to remove dirt, do not use soap or detergent; use de-ionized or distilled water only. A porous material such as ceramic will soak up the soapy water and it will be impossible to rinse all of it out again. Careful vacumming may make it unnecessary to risk washing.

If a ceramic appears to have been hand-painted rather than kiln glazed, test the colours first to make sure they won't wash off in water. Items which have flaking glaze or paint should not be washed at all. Be sure that the ceramic piece is thoroughly dry before packing away; if it looks dry, but feels cold, it is still wet.

Fluctuating humidity can cause damage to porous objects like ceramic, due to the mechanical action involved in the dissolution and recrystallization of salts which may have entered the clay from previous contents, or during the burial of archaeological materials. This may be controlled by including sachets of silica gel in closed storage containers. If the silicia gel contains some of the indicating "Tel-tale" type, watch can be kept and the gel replaced and regenerated when necessary. (See page)

Stone

Stone is a porous material, similar to ceramic, and can be affected the same way by fluctuating humidity. In addition, it is often used for works displayed outdoors, such as statues and tombstones. These are subject to attack from airborne acids, dust, bird-droppings, rain, heat from the sun, and the mechanical action of ice crystals in a freeze/thaw cycle. This last item is especially noticeable in Southern Alberta, where warm chinook winds can send the temperatures up and down 20 degrees (Farenheit) in a matter of hours.

Where at all possible, stone items out of doors should be protected from direct sun, snow and rain. If there is active deterioration, a conservator should be consulted; it may be necessary to find another location for the piece, or even replace it with a replica, and move the original to safer surrounding indoors.

Stone items inside a building are best treated as ceramic. Surface dirt can be removed by vacuuming. Smooth, non-porous stone surfaces can be further cleaned with Goddard's Marble Polish. Marble and alabaster can be dusted, but should not be washed without advice from a conservator, as soluble elements may be removed which will ruin the polish. Marble and alabaster should not be placed in contact with straw, wood, ordinary cardboard, paper, or unbleached cotton. The lignin in these materials may cause ineradicable staining.

Metals

With the exception of pure gold, all metals will corrode in the presence of oxygen, chlorides, or gaseous sulphur. This is accelerated by the presence of moisture and dust, so metal must be kept clean and dry.

Corrosion begins with surface discoloration, sometimes called "tarnish", but can continue to form pits. If dust is allowed to accumulate on the surface it can set up tiny galvanic cells and stimulate corrosion. Where high humidity is a problem, as in basements, small packets of silica gel can be placed in closed containers with the artifacts, to be replaced when exhausted as described above. Do not allow the silica gel to come into direct contact with the metal. Vapour-phase corrosion inhibitors, such as "Silver Safe" or "Zerust," can be used in enclosed spaces to help prevent active corrosion, but

side-effects, such as formation of a yellow film, have occasionally been reported, so inspect every few months. Acids, salts and oils from unnoticed fingerprints will etch into polished surfaces. As they can only be removed by grinding down the surface, the use of cotton gloves is essential whenever metals are handled

A word about metal polishes: remember that polishes clean metal by abrading away the surface, so aim for preventive care rather than frequent cleaning. If polishing is necessary, start with the least abrasive polish first, and gradually work your way up. Clean a sample area and examine it for scratches under a magnifying glass if in doubt. Goddard's Long Shine Silver Cloth is the gentlest we know of, and can be used on any metal except lead or pewter, but keep separate cloths for each type of metal. Sodium bicarbonate (baking soda) applied on damp cotton is inexpensive, gentle, and effective.

After using baking soda or any other polish containing a powder (such as the white or pink liquid polishes), RINSE thoroughly under running water (use distilled if your water has high iron or other mineral content), removing all residue with a soft tooth brush, and dry immediately. The freshly cleaned metal surface will be highly susceptible to corrosion, so try to package for storage immediately.

If an important item is so rusty or corroded that the surface cannot be seen, do not attempt to clean it. Corrosion products can hide cracks and breaks. Over-zealous use of commercial rust removers can etch the surface, or dissolve corrosion holding the metal parts of the object together. Handle these artifacts as fragile and keep them dry until they can be examined and treated by a conservator.

Gold

Although pure gold does not corrode, it may be found as gilding over a base metal, or alloyed with copper or silver to form jewellery, medals, and coins. (See below for coins). Gilding is usually very thin, so polish with great care. Do not use liquids if the gilding is on plaster, wood, or other porous materials.

On rare occasions, the metal with which the gold has been alloyed will darken.

For both of these cases, polish very gently with the Goddard's Long Shine Silver Cloth.

Silver

Silver must be isolated from air-borne pollutants such as sulphur. Before storing, it should be cleaned with Goddard's Long Shine Silver Cloth, or Long-term Silver Foam. For cases of extremely resistant tarnish, or for badly worn Sheffield plate where copper is exposed, call a conservator for advice. After cleaning, each piece should be wrapped first in soft acid-free tissue (Lithowipes), then in anti-tarnish paper (if available), and then sealed in tightly closed polyethylene bags. Alternatively, an anti-tarnish cloth is available, called "Pacific Silver Cloth", which is suitable for lining of storage boxes, drawers, display cases, and the making of storage bags. This is fairly expensive but advisable for valuable pieces.

Copper and Alloys

Copper may be used alone, or as the major constituent in brass and bronze. These should be protected from atmospheric pollution in the same manner as silver. If the item is merely darkened, it may be cleaned with a Goddard's Long Shine Silver Cloth (mark it for us on copper only) or with Goddard's "Glow" multi-purpose paste, or Nevr-Dull Magic Wadding. If the surface of the item is green either in part or completely, consider before attempting cleaning whether the green represents an aesthetically valuable patina. If the object has spots of fluffy, light green powder, keep it as dry as possible and call a conservator. This is "bronze disease", and if left untreated may perforate the metal. Request CCI Note 9/3 for a fuller discussion of cleaning, polishing, and protecting brass and copper.

Lead and Pewter

Lead is an amphoteric metal: This means that is is highly sensitive to both acids and bases. Any item made out of lead, or a lead alloy (pewter) may be wrapped in soft acid-free material, but not in anti-tarnish or buffered papers which have had alkaline salts added. Lead must never be stored in wood (especially oak or plywood), cardboard, or ordinary wrapping papers, as the acidic vapours will convert the lead metal to a white powder.

"Britannia Metal" and Other White Metals

These alloys have been particularly popular since Victorian times for decorative objects. Without scientific analysis it is almost impossible to tell what metals have been used in the alloy, although tin antimony, zinc, and copper are common constituents. Treat them according to the general principles outlined and the advice in the section on copper.

Medals, Coins, and Tokens

Although the metals of which these are made are subject to the principles already discussed, numismatic collections present several unique problems.

Cleaning: professional numismatists advise that cleaning may destroy the financial value of a collection, so concentrate on preventive storage instead.

Commemorative cases: these are often made of acidic, sulfur-bearing materials, so they are best stored separately from the coins, appropriately cross-referenced.

Storage materials: numismatic items are small and easily lost. Because they are also easily categorizible, they are usually stored in pages with slots or pockets. Unfortunately collector's pages with labels and coin-sized depressions are made of acidic materials which frequently tarnish the contents, reducing their value. Vinyl slide-storage pages provide a convenient format, but must NOT be used, because they contain chlorides, which corrode metal, and plasticizers, which have been observed to ooze out and coat the contents with a slimy, discolouring film.

Working out a safe method for the size and type of your collection is complicated, because we have not yet found complete ready-made, archivally safe systems for numismatic collections, and making your own is time consuming. Some coin folders are now available with mylar liners: these seem to be the most advisable, although we have not been able to find out whether the mylar is the safe "Type D", or another kind. Also, it is not a good idea to have the metal in long-term direct contact with a plastic material, because of the risk of discolouration.

In general, the archival materials developed for the safe storage of photographic slides should be adaptable for numismatic materials. The Archaeology Program of The Provincial Museum has been investigating similar storage materials, and may be able to give you advice.

Iron and Steel

Iron and steel must be kept dry. To remove dirt, dry brush first. Water washing should be avoided whenever possible. If washing is essential, for example to removed caked-on dirt and straw which would retain moisture and stimulate rust, then dry the iron immediately with a hair dryer.

Alberta's climate is dry enough (except during summer thunder showers) that iron can simply be stored in a dry place, with acid-free materials, and away from acidic vapours.

Old, dark-red rust may not be aesthetically desirable, but does not usually cause as much damage as attempts to clean with commercial rust removers or vinegar. Do beware of fresh yellow rust: brush it off and keep the object dry, with silica gel sachets in a closed container if necesary. Zerust vapour phase corrosion inhibitors may also be helpful if you can create a sufficiently enclosed area. A coating of light mineral oil, and sprays like CRC336 and WD 40 may be helpful to prevent light overall rust, but may leave messy stains, and be difficult to remove if further treatment is necessary. It is preferable to prevent high humidity around iron by correcting problems, such as leaks in the storage area.

Iron and steel are familiar presences in our industrial world, but unfortunately, most of the commercial products available for cleaning and protecting iron are too agressive for use on artifacts, while the chemicals used by conservators are not readily available to the public. Cleaning and protecting iron can be as complex as cleaning a textile, so consult a conservator for individual advice.

Heavy Equipment and Vehicles

Machinery with moving parts should have dirt removed, and be oiled before storing. Motor vehicles such as cars should be placed on blocks and have the gasoline and motor oil drained.

Tyvek covers, designed for automobiles, make inexpensive loose covers, to protect from leaks and dust.

Equipment should preferably be stored inside, as dirt, leaves, rain, and snow will hasten deterioration. If inside storage is unavailable, equipment should at least have a shed roof above, and some means of keeping mud and rising damp from metal wheels: a damp-proofed concrete pad is advisable if funds permit.

The Reynolds-Alberta Museum in Wetaskiwin can provide additional advice.

COMPOSITES

This is the broadest class of artifacts, containing items composed of two or more different materials. The main problem in storing these items is to find a happy medium in the environmental requirements of the different materials.

For animal and vegetable composites, such as reed baskets with leather handles, the problems of environment control are not too difficult. Both are organics, and the humidity and temperature requirements are the same. It is necessary to guard against biological attacks, dust and breakage, fluctuating humidity, and excessive light and heat.

As soon as mineral components enter the picture, the problem changes. Organic materials can tolerate RH levels as high as 55% as long as the level remains steady, but associated metals will discolour and corrode. A low humidity level will preserve the metal, but the organic components will shrink, warp, embrittle, and weaken.

This is particularly true of composite leather and metal objects, since leather dressings cause corrosion of copper alloys such as brass studs. These corrosion products in turn stain and weaken the leather.

Fluctuating humidity produces mechanical stress as the organic parts attempt to maintain equilibrium with the environment. As each component moves at a different rate, this can result in loss of paint, warping, splitting of canvasses, cracking of varnishes, lifting of veneers, and splitting of skins on stuffed animals.

Composite objects should be handled carefully and be protected from dust, heat, light, air pollution and biological attacks, and kept in a stable environment of temperature 68°F and relative humidity 45-50%.

Musical instruments

These are usually composite artifacts.

Their requirements vary too much for general rules, beyond careful attention to humidity controls, and releasing the tension on stringed instruments. Consult musicians who play the types of instruments in your collections.

PHOTOGRAPHS AND NEGATIVES

Photographic materials are composites of silver and plastic or paper, and require special handling and storage techniques.

As bare fingers will leave uncleanable oily smears which will attract scratchy dust, lint-free gloves must always be worn during handling. High temperatures will cause films to become brittle, and will cause emulsion fading, even in the dark. All photographic materials should be stored in a cool, completely dark area. Frozen storage is advisable for important materials: The procedure is described in The ANSI Standard "Practice for Storage of Processed Safety Photographic Film".

Since wrappings and containers which are safe for paper or documents are too rough for delicate emulsion surfaces, it is best to use materials specifically designed for archival storage of negatives, prints, and plates. Acid-neutral, clear, inert, mylar envelopes are available for film negatives which will allow viewing and printing without touching the film surface. Acid-free envelopes and folders, and light-tight and dust-free boxes and cabinets have been designed for the safe storage of prints, slides and glass plates.

Weinstein's book: "Collection, Use, and Care of Historical Photographs" should be read thoroughly by anyone with an archival photographic collection. Reprint material available from The Conservation Program at The Provincial Museum provides advice for the storage of modern photo documents.

Repair and restoration of photographic materials is difficult, it is advisable instead to rephotograph and retouch the reproduction.

Paintings

Paintings, documents and textiles in frames are also composite artifacts, but each poses special storage problems.

Paintings are fragile. They should never be stacked on top of each other, or allowed to lean against each other or against a wall. Even slight bumps or knocks can cause cracks in the paint film, and chips in the frame. It is especially important to guard against accidental dropping, or blows to the back of the canvas.

The best method for storing painting and framed works is on vertical mesh-screen panels which can be pulled out on a ceiling track. This protects the back of a painting from bumps and knocks, and allows the work to be inspected without excessive handling.

Shelving with cushioned bottoms and vertical dividers to make slots are a less expensive alternative for paintings grouped by size.

PART III: A PLACE FOR EVERYTHING

This section contains short descriptions of the supplies mentioned in the previous text, and the places where they can be purchased. Suppliers' mailing addresses and telephone numbers are listed in alphabetical order in Part IV.

Catalogues which make handy references are available from:

Carr Maclean - Archival Products
461 Horner Avenue
Toronto, Ontario
M8W 4X2

Archival Conservation Resources Ltd.
P.O. Box 2506
Station D
Ottawa, Ontario
K1P 5W6
(613) 523-9260

W.J. Stewart Co.
1970 Ellesmere Road, Unit 11
Scarborough, Ontario
M1H 2W1
(416) 438-2991

Process Materials Corporation
301 Veterans Blvd.
Rutherford, N.J. 07070
(201) 935-2900

Light Impressions
439 Monroe Avenue
P.O. Box 940
Rochester, N.J. 14603

Museum and Archival Supplies Handbook
Ontario Museums Association
38 Charles Street, East
Toronto, Ontario
M4Y 1T1
(416) 923-3868

STORAGE FURNITURE

NOTE: Ensure that all baked enamel finishes are baked and dried to odorless state.

A 2-component epoxy coating is considered the most stable at present writing.

Notes and Samples

Compacting Storage System

This is a system designed to maximize storage space. Shelves and cupboards run on tracks, to open an access aisle where it is needed. Designed, and especially suited for documents, artifacts will probably need space-consuming special packaging to prevent rolling, vibration and shock.

Suppliers: Spacesaver Corporation
Montel
Lundia

Art-Map Storage Cabinets

A "modular" four or five drawer unit: steel, baked-enamel finish, safety stop on all drawers. Units may be stacked 2, 3 or more in height; bases ordered separately.

Price: 5 drawer unit: 17 1/6" h x 53 5/8" w x 39" d = $733.00
1 drawer: 2 1/4" h x 50" w x 38"d

Suppliers: Carr MacLean (send for catalogue)
Office Equipment and Supplies

Artifact Storage Cabinets

These are steel cabinets with all welded construction. They have reinforced steel doors and come in a variety of sizes. They can be custom built to meet the customers specifications. They can be ordered with adjustable steel trays.

Suggested Price: $1,228.00

Suppliers: Dompro (B210 Artifact Cabinet)

"Lista" Storage Drawers
Machinist's Cabinets

Notes and Samples

These are modular, baked enamel on steel cabinets in a variety of sizes. Drawers are available with either solid or perforated bottoms and can be further subdivided by metal or plastic partitions. Catalogue of styles and sizes available from company on request. Prices according to size or cabinet, number of drawers.

Suppliers: Wilcor Storage Systems
CAE Morse

Stationery Storage Cabinets

These are baked enamel finish steel cupboards with reinforced lockable doors. They are not the same as flammable storage cabinets.

Price: 72" h x 36" w x 20" d (4 shelves) = $329.83
42" h x 36" w x 20"d (2 shelves) = $235.14

Suppliers: Carr MacLean
Office Equipment Suppliers
ie., Millers Stationers

"Redirack" Shelving

Notes and Samples

This is a steel framework consisting of upright frames with welded cross braces. Steel bars with a bracket on each end hook onto the side uprights at 3" intervals. Metal shelves are available and preferable, or shellaced plywood can be set across these bars to form a shelf. Additional units can be added on. Price varies with size of upright, length of bar and number of prices.

Price: for a 6 shelf unit 10' h x 4' 1 x 24" d = $228.41

Suppliers: Northern Eau Claire Construction Materials Ltd.
Western Storage Systems, Ltd.

IKEA Shelving "IVAR"

Assemble it yourself shelving, unfinished pine (finish with Shellac). Shelves and end pieces must be purchased separately. Available in a variety of widths and heights; prices vary accordingly. Catalogues available.

Sample Price:
(2) 180 x 50 cm side unit @ $15 each = $30.00
(1) 5 shelves (50 cm x 8 cm wide) @ $65 per set of 5 = $65.00
(2) cross braces @ $4 each = $4

Total: One shelf unit = $103.00

Suppliers: IKEA Furniture Stores

Spacemaker Shelving

Baked-enamel finish on steel shelving nut and bolt construction, shelves adjustable every few inches.

Sample price:
72" l x 36" w x 18" d = $25.00

Suppliers: Hardware and Department Stores

Notes and Samples

BOXES AND CONTAINERS

Acid-Free Cardboard Boxes

Boxes with telescoping lids, made of acid-free cardboard.

Prices vary with size of box and number ordered. Write supplier for details.

Suppliers: W.J. Stewart
Process Materials Corporation

Archival Solander Boxes

"Clamshell", meant for the storage of prints. Made in one-piece, with hinged lid, of acid-free board (pH 8.0), Permalife liners, washable covers.

Price: 15 1/4" x 10 1/4" x 3" = $3.72
12 1/4" x 9" x 3" = $3.08

Suppliers: W.J. Stewart

Coroplast Tote Boxes

Made of chemically inert polyethylene-polypropylene copolymer plastic. Invaluable for carrying artifacts, and for space-saving stackable storage.

You could make your own from sheet Coroplast (also known as "Corex"). the Coroplast company will supply box patterns for customers to cut sheets, or will make boxes to specifications (minimum order 1,000). (See also Sheet Supplies, Coroplast). You can also buy them pre-cut in flat bundles ready for assembly, from Coroplast or Cadillac in a variety of sizes and shapes, with and without lids. Sizes range from 18" l x 11 1/4" x x 6" h to 24" l x 13 1/2" x x 12" l. A medium-sized box costs $5.25.

Suppliers: Coroplast
Cadillac
or see your local Post Office for advice

Notes and Samples

"Plastic Folding Tote Box
This is similar to the Tote Boxes above, but higher and shorter"

Notes and Samples

Made of coroplast plastic. Boxed flat for shipping and storage, can be assembled as required. Recessed carrying handle, lock, tab, dust proof lids, title card holder at one end.

Price: 12" x 15" x 10" = $10.45

Suppliers: Carr MacLean

"Tote Boxes"

Ordinary cardboard, telescoping lid, recessed handles, not acid-free.

Price: 15" x 10" x 12" = $2.75 each

Suppliers: Millers Stationers Ltd.
Willson's Office Supplies
IKEA

Industrial Containers

These are stackable trays and bins for a variety of commercial uses; from ice cream to blueberries. They must be constructed of polyethylene or polypropylene.

Price: $10.89 to $50.00

Suppliers: Pro-Western Plastics
Mayfield Storage Systems (Schaeffer)
Restaurant Suppliers

"Frigoseal" Containers

Polyethylene boxes with tight fitting snap-on lids; variety of sizes, round and rectangular, 4" x 4" x 2" deep to 10" x 12" x 6" deep.

Price: Varies with size and shape

Suppliers: Grocery and Department Stores

Glass or Polyethylene Vials
Notes and Samples

These come in a variety of sizes and shapes. Prices according to size.

Suppliers: Scientific Suppliers
i.e. Fisher, Canlab

"Media Saf" Shelf Filers

Stackable polystrstyrene boxes, 12" x 4 1/4" x 4" deep. Three colors with removable inserts for cassettes, film cans.

Price: $88.00 for 3 boxes

Suppliers: Carr MacLean

Pasteboard Pill Boxes

Two piece "matchbox" style boxes with box bottom sliding into the top cover. White, not acid-free,

Prices varies with size.

Suppliers: Fisher

Clear, Polystyrene Boxes

Clear, plastic shoeboxes and notions boxes, with colored lids, various sizes.

Sample Prices:
12" x 6" x 4" = $2.98 each

Suppliers: Woodwards
Canadian Tire Stores

"Seal Tight" Petri Dishes Notes and Samples

Small (50 x 9 mm) clear polystyrene petri dishes with tight fitting lids. Useful for small items such as buttons or jewelry, or for Natural History specimens such as seeds, leaves and insects.

Price: $125.63 per case of 500

Suppliers: Scientific Suppliers
i.e., Fisher

ENVIRONMENTAL MONITORING AND CONTROLS

See the Canadian Conservation Institute Technical Bulletin No. 3, for details on environmental monitors and Bulletin Nos. 1 and 5 for standards

Contact: CCI
1030 Innes Road
Ottawa, Ontario
K1A 0M8

Environmental Chambers and Humidity Tents

Notes and Samples

It is possible to build humidity chambers for artifacts when needed, or even to adapt part of a storage area to higher humidity, without expensive contracting and equipment. For small objects, a frame of 2" x 2" wood is built, large enough to accommodate the item without bumping into the sides. This frame is then completely covered; top, bottom and sides, with heavy weight polyethylene sheeting (10 mil). All seams, stamples and tacks are sealed with waterproof (electrician's or duct) tape, and the interior, especially the wood, is sprayed with water. Any excess is mopped off the inside and the chamber is ready for use. A thermohygrometer should be placed inside to monitor the humidity level. When necessary, a dish of wet paper towels can be placed inside to raise the humidity. Silica gel can be placed inside to lower it (omit initial spraying).

Larger walk-in versions can be constructed of 2" x 4" studs, in the same way as a house, with doors on hinges (aluminum doors are the most vapour proof). In these large units, floor humidifiers are more efficient than hand sprayers. Use only drum type humidifiers, not vapourizers or sprays, as these will deposit fine mineral dust everywhere. A fan to keep the air circulating will help to avoid moisture condensation.

In joining the wood, use stainless steel or brass nails or screws, others will rust.

Polyethylene Plastic Sheet: See Sheet Materials, Synthetic

Prices: Wood - 2"x2" = 10¢-15¢ linear foot
2"x4" = 20¢-25¢ linear foot
Aluminium Doors - $150.00 for door and frame (or make door of wood and polyethylene)

Suppliers: Lumber Companies; door and window supply companies; building supply companies

Humidifier

A humidifier is essential for maintaining an adequate relative humidity in the face of Alberta's dry summers and winter heating.

The best model is one which has a revolving drum, a rheostat switch to control speed, and an inside sensor which can be set to continuous operation, or automatic shut-off at certain humidity levels or when the waterpan is empty. The reservoir should be as large as possible, and easily removable for frequent cleaning of mineral deposits and mould.

The humidifier's speed should be adjusted by checking with a hygrometer to obtain a steady relative humidity level. The humidistats normally cycle over a 10% range.

Prices: $135.00 to $170.00 per unit

Suppliers: Woodwards
Sears
Appliance and Furniture Stores

Recording Hygrothermographs

"Belfort" battery operating, with a human hair sensor. Records both temperature and relative humidity. Battery operating model with monthly charts recommended.

Price: $925.00 each

Suppliers: Wellsdale Research Ltd.

Notes and Samples

Psychron

This is a battery operated version of the sling psychrometer. We use it for spot readings and to calibrate other equipment, as it seems to be the most consistently accurate instrument we have found. Be sure to use the charts in the accompanying booklet to calculate RH precisely.

Price: $379.05

Suppliers: Scientified Suppliers
i.e., Fisher

"Humichek Deluxe III"

This is a battery operated humidity monitor for spot checking and for calibrating hygrothermograhs. It does not operate continuously.

NOTE: Needs about half an hour to equilibrate for accurate reading when you move between humidity zones.

Price: $760.82

Suppliers: Beckman Instruments

Psychrometer, Sling

Note:
1. The thermometers need to be checked for calibration.
2. Accuracy depends on length and speed of whirling. Check with manufacturer.

Price: $72.76

Suppliers: Scientific Suppliers
i.e., Fisher, Canlab

"Covey" Thermohygrometes
A liquid crystal strip never needs calibrating. Covers the range from 30% to 60% RH

Price: $41.60 (US)

Supplier: Conservation Materials Ltd

Thermohygrometers

These are small "travelling clock" style units, which measure temperature and relative humidity. A variety of models is available from hardware and department stores, and scientific supply companies.

Price: $86.85

Suppliers: Conservation Materials

Humidity Indicator Cards

Small cards with a pink/blue scale for the monitoring of humidity in containers, drawers, cupboards. Indications are approximate to nearest 10% and change slowly. For impoverished budgets.

NOTE: Sensitivity is diminished by presence of sulphur in the air.

Price: $17.15 for a package of 25

Suppliers: Conservation Materials, Ltd.

Thermopapers

Small strip of paper impregnated with a heat sensitive chemical; irreversible color change records temperature in containers, cupboards, display cases. Lowest range 50°F and up.

Price: $5.25 for package of 60

Suppliers: Talas

Notes and Samples

Notes and Samples

Light Meters

"Gossen Panlux", a device for measuring in lux, the light falling on the surface of an object.

Price: $250.00

Suppliers: McBain

(Less expensive photographic light meters can also be used, provided they are sensitive in the low range. CCI Note 2/5 provides instructions for converting light meter readings to lux.)

Digital Luxmeter

"ANA" 999

Price: $199.00

Suppliers: Optikon Corp. Ltd.

Ultra-Violet Meter

"Crawford" Ultra-violet monitor, a device which measures the amount of ultra-violet radiation falling on the surface of an object.

Price: Approx. $528.00 (Cdn)

Suppliers: Science Associates

Blue-Scale (Textile Fading Cards)

Cards with swatches of blue fabric especially dyed to fade at given rates for monitoring fading of artifacts in showcases or windows. Keep a sample in the dark for comparison

Price: $1.50 each

Supplier: Talas

Solar Control Film

Notes and Samples

These are polyester films designed to reduce the amounts of heat, light and ultraviolet radiation entering a window. Available in a range of colors from clear to dark smoke, they may be applied directly to the glass, or installed as pull-down shades.

Useful on display case glazing as well as on windows. Ask for the scratch-resistant type. You might be able to get roll-ends from installation companies for small applications.

There are many suppliers, so check what is available in your area, and ask for specification sheets that show what percentage of ultra-violet light and total visible light are screened out. You should not accept less than 97% screening of ultra-violet for museum purposes. There may be thermal insulating type filters which incorporate U.V. filtering to help you save on energy consumption while protecting the objects in your display areas, but beware of mirror-finish films, as these are usually considered aesthetically incompatible with historic buildings.

The films we have found more useful are:

- neutral gray in various densities, which do not disturb color values, do cut out ultra-violet, and cut light levels to some extent. However, be forewarned against a false sense of security: you will still need to use curtains or shades to lower light levels for light-sensitive objects, because even the darkest grey films, which cut out all but 11% of daylight will only lower Alberta sunshine from 8000 lux to 880 lux, while the maximum safe level for objects of medium light sensitivity is 150 lux.
- colorless film: this is useful for historic buildings, as it does not change the appearance of the window. It screens out only ultraviolet.

Price: Varies with amount of window to be covered and type of film used.

Suppliers: Solar King
Solar Screen

Ultra-Violet Filtering Tubes

Notes and Samples

Plastic tubes designed to slide over fluorescent light tubes and filter out the ultra-violet radiation. Price varies with size of tube and number order.

Sample Price:
Minimum order, 25/case . $6.50 per 48" tube

Suppliers:
Commercial Plastics and Supply Company
Cadillac Plastics

CCI Notes

Ultraviolet Filters for Fluorescent Lamps

2/1

Introduction

Ultraviolet (UV) radiation emitted by fluorescent lamps can be damaging to many types of material found in museum collections, such as textiles, paper and pigments. In all areas where sensitive materials are exposed to fluorescent light, it is important to remove as much of the UV component of the light as possible. This removal of UV does not alter the level of illumination or the visual quality of the light.

The UV output of a lamp can be measured with a UV monitor such as the Crawford Type 760. Filtration is necessary when the proportion of UV in the light is more than 75 μW/lm. The greater the reading, the more urgent is the need for filtration. A list of the UV output of many commercially available fluorescent lamps is given in the CCI Technical Bulletin no. 7.

Recommendations

The simplest way to reduce UV radiation from fluorescent lamps is to install filtering sleeves or tubes. Certain diffusers will also absorb UV, but they are not adaptable to all fixtures.

There are two types of filters: soft, thin plastic sleeves and hard plastic tubes. There is a substantial price difference between the two, the tubes costing as much as five times more. In terms of efficiency and life expectancy, both types are equal. Both will retain their UV-absorbing properties for at least ten years. As a precaution, their efficiency should be evaluated every three to five years by sending a small sample (5 cm X 5 cm) of a used filter to the Canadian Conservation Institute for testing. There have been some reports that the thin sleeves tend to slip off the lamp after a few years. Adhesive tape at each end will solve this problem. Although some deterioration of the plastic (such as embrittlement) can occur, the UV-absorbing properties are not affected.

Suppliers

UV Monitor: Crawford Type 760
Littlemore Scientific Engineering Co. Ltd.
Railway Lane, Littlemore
Oxford OX4 4PZ
ENGLAND

Filters: All filters listed below are manufactured in the U.S.A. Check for a local office or distributor in your area.

Arm-A-Lite Filter Ray Shields (hard plastic tubes, $8-$10/122 cm):
Thermoplastic Processes, Inc.
Valley Road
Stirling, NJ 07980
(201) 647-1000

Duroguard UV-absorbing Safety Shields (hard plastic tubes, $8-$10/122 cm; order number 9907-016):
Duro-Test Corporation
2321 Kennedy Blvd.
North Bergen, NJ 07047

Solar Screen Sleeves (thin plastic sleeve, $2.00/122 cm):
Solar Screen Co.
53-11 105th Street
Corona, NY 11368
(212) 592-8222

(No known Canadian representative, but delivery is normally good.)

NOTE: Many suppliers of plastic products sell tubes and sleeves; if doubts arise as to the suitability of a particular product, samples can be sent to the CCI for evaluation.

The costs stated are examples of typical prices at the time of publication.

Further Reading

Lafontaine, Raymond H. and Patricia A. Wood. Fluorescent Lamps. Technical Bulletin no. 7. Rev. ed. Ottawa: Canadian Conservation Institute, 1982.

Lafontaine, Raymond H. Environmental Norms for Canadian Museums, Art Galleries and Archives. Technical Bulletin no. 5, 1979. Reprint. Ottawa: Canadian Conservation Institute, 1981.

Macleod, K.J. Museum Lighting. Technical Bulletin no. 2, 1975. Reprint. Ottawa: Canadian Conservation Institute, 1978.

Copies are also available in French
Des copies sont disponibles en Français

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June 1983

National Museums of Canada

Canadian Sources:

Commercial Plastics and Supply Company
47 Gurney Cresent
Toronto, Ontario
M6B 1S9
(416) 787-4214
(Minumum order: 25/case @$6.50 per 48" shield)

Cadillac Plastics
15531 - 115A St.
Edmonton, Alberta
(403) 451-1650

ARCHIVAL STORAGE

See also archival catalogues listed at the beginning of Part III.

You may also write for advice to:

Klaus B. Hendriks, Ph.D.
Photo Conservation Laboratory
Public Archives of Canada
OTTAWA, Ontario

and contact:

Alberta Archival Photographic Services

/309, 3600 Brenner Drive N.W.
Calgary, Alberta T2L 1Y2
(403) 282-2126

This is a new company which can provide advice, services and supplies:

Notes and Samples

Archivist's Pen

A writing pen designed to carry pH indicating ink, for spot checking documents. The small dot of ink remains visible; yellow at pH 3.6 and blue at pH 5.2 or higher.

Price: $14.95 each

Suppliers: Talas

pH Indicator Papers

"Colorphast" small plastic strips with the indicator squares at one end. Each has from 2 - 4 squares, to test either the full pH range, or more accurately a narrower range. Meant for testing solutions; may work to test acidity of paper by wetting the strip and paper with distilled water and pressing the strip against a non-watersoluble area.

Price: $18.27 per package of 100

Suppliers: W.J. Stewart Co. Ltd.

Kodak Sleeves

Transparent acetate covering for both colour transparencies and black-and-white sheet film.

Examples:

Cat. No.	Size	# per box	Price
152 3265	4"x5"	100	$12.75
152 3273	5"x7"	100	$17.49
152 3281	8"x10"	100	$33.68

Also available in the following sizes: 2 1/4 x 2 1/4 x 3 1/4, 2 1/2 x 3 1/2, 3 1/4 x 4 1/4, and 11 x 14.

Suppliers: Kodak Canada Inc.

Kodak Storage Envelopes for Processed Films — Notes and Samples

Sandwiched material of polyethylene, foil, and paper.
For use in storage of processed films (negative or transparencies) for extended periods of time, and for freezing film.

Cat. No.	Size	# per box	Price
148 6398	4"x5"	50	$7.47
149 0028	8"x 10"	50	$10.80

Suppliers: Kodak Canada Ltd.

Print and Negative Storage Sleeves

Clear sleeves made from Mylar Type D, an uncoated polyester film. Made by DuPont.

Suppliers: Archival Conservation Resources
W.J. Stewart
Light Impressions
Talas

2" x 2" Cellulose Acetate Slide Protectors

Suppliers: The Kimac Company

SAF-T-STOR Slide Page (#PV-20)

Made of Polypropylene.

Price: $33.75/25 pages

Suppliers: Franklin Distributors Corporation
University Products
W.J. Stewart Co.

Print and Film and Slide Storage Boxes

Suppliers: Saxe Archival Systems
The Hollinger Corporation

GENERAL EQUIPMENT AND SUPPLIES

Acid-Free Rolling Tubes

For the storage of flat textiles, large maps, drawings, etc. Made of acid-free paper, bonded with a water-resistant neutral pH adhesive, buffered against acid migration. Minimum pH 7.0.

Price varies with diameter of tube and amount ordered. Sold in carton only. Write to supplier for specifications and price list.

Suppliers: Process Materials Corp.

Construction Tubes

"Sonar" or "Permatubes": used for pouring concrete. These are available in a variety of sizes, and are especially handy for rolled storage of large flat textiles. They are inexpensive, but acidic, and must be covered with Mylar Type D or aluminium foil and then with a cushioning material to prevent slipping. This could be acid-free tissue, or polyester quilt batting covered with surgical stockinet for textured surfaces such as quilts.

Suppliers: Perma tubes
Construction suppliers

ABS Pipe

Also useful for rolled storage of textiles and for display support of garment shoulders. Should be covered as above.

Supplier: Hardware and plumbing stores.

Notes and Samples

Cotton Gloves

Notes and Samples

Worn when handling artifacts to protect them from skin salts, acids and moisture.

Price: $1.55 per pair.

Suppliers: Tex-Pro Western Ltd.

Nylon Gloves

Worn as cotton gloves but thinner and lint free. May be slippery.

Price: $1.75 per pair.

Suppliers: Safety Supply

Tru-Touch Disposable Gloves

Thin plastic surgical gloves, come in medium and large. Not resistant to solvents.

Price: $8.95 for box of 50.

Suppliers: Gainers Medical & Surgical Supply Ltd.
Scientific Suppliers
Drug stores

Portable Heat-Sealer

"Futura, poly model", a hand-held electric tool, with teflon-coated 6" jaws. Will seal most types of plastic but not teflon or mylar. Useful for making storage bags and dust covers.

Price: $145.00

Suppliers: Jeffery Moore Co. Ltd.

Polypropylene Trays

These come in a wide range of sizes, from small to large tanks, with or without faucets and lids. Prices vary according to size. Write supplier for details.

Suppliers: Canlab
Fisher
Sargent-Welch
Pro-Western

Silica Gel

This is a chemical desiccant. Naturally white, it can be dyed with cobalt blue which indicates moisture content, turning pink when exhausted. Silica gel becomes "exhausted" when it has absorbed as much moisture as it can hold. At this point it must be replaced by fresh crystals. Exhausted silica gel can be regenerated and reused by heating in an open container in a slow oven (150°-175°F) until the color returns to blue. Do not put hot silica gel in with an object: wait until it cools down. DO NOT PLACE THE OBJECT IN DIRECT CONTACT WITH THE SILICA. The desiccant can be put into small bags like perfume sachets, or the object can be protected by means of its wrapping of paper.

The coarser mesh types are preferable to the fine powders. It is cheaper to purchase a small amount of the "Tel-Tale" or indicating type and mix it evenly into the white variety.

Price: Indicating = $93.00 for 5 pounds
Non-indicating = $21.78 for 500 g.

Suppliers: Fisher Scientific
Canlab
Scientific Suppliers

Notes and Samples

Tygon Tubing Microbore

Notes and Samples

Very fine optically clear plastic tubing useful for covering pins and wire in supports and as a substitute for wire. Five sizes, sold in spools of 100 lineal feet, separately or as a set.

Price: assorted 5 pack = $69.50 (US)

Suppliers: Cole-Parmer Instrument Co.

CLEANERS AND POLISHES

Canned Air

"Dust-off" cans of compressed air for dusting. Nozzle and air cannister may be purchased separately.

Price: $4.95 refill
$8.95 nozzle

Suppliers: Photography Suppliers, i.e. Calgary Photo, McBain

Blower Brushes

Small rubber bulbs with a sable brush attached. Air is blown through the brush by squeezing the rubber bulb.

Price: Small = $2.95
Med. = $3.95
Large = $4.95

Suppliers: Photography Suppliers e.g. McBains, Calgary Photo, Shipley, etc.

Hoover Porta Power Vacuum

A small, portable vacuum cleaner with a number of attachments and an adjustable suction control. When using on artifacts, set suction control on minimum, and place two or three layers of cheese cloth or nylon net over the nozzle, to further reduce the vacuum power and to catch any beads or buttons, etc. which may be accidently knocked loose.

Price: $155.00

Suppliers: Major Department Stores e.g. Woodwards

Notes and Samples

Stoddard's Solvent

Notes and Samples

This is an aromatic non-polar solvent similar to "Varsol" or "white spirit". Use only in well ventilated areas.

Price: 4 litres = $47.72

Suppliers: Fisher Scientific
Canlab
Terochem

Methyl Hydrate

Methyl alcohol or wood alcohol. This is highly flammable and poisonous and must be used in well ventilated areas.

Prices: 4 litres = $23.99

Suppliers: hardware stores
scientific suppliers

Hide Food

A neutral-colored cream dressing for the cleaning and lubrication of hides and leather.

Price: 100 (English Pound) = 72 jars (min. order)

Supplier: Connolly Bros. (Curriers) Ltd.

Orvus Paste

Notes and Samples

This is an anionic, neutral to basic (pH 7.3 to 7.8) detergent based on sodium laurel sulphate. Used for cleaning any water washable item. Use no more than 1% soap to wash water, and rinse thoroughly. Orvus will melt at temperatures over 75° but it will not "spoil".

Orvus paste may also be purchased under the names Shur-gain Animal Shampoo, David and Lord's Animal Shampoo, and Canada Packer's 645-WA Paste.

Suggested price: 1 kilogram = $6.28

Suggested suppliers:
Shur-gain Division, Canada Packers
United Farmers Co-op
Canada Packers

Lysol Spray

This is a solution of orthophenylphenol in ethanol for moulds and mildew. Only the Lysol spray is acceptable for use on historic materials: the liquid has a different formulation.

Life brand "The Exterminator" had a similar formulation at the time of writing.

Price: $2.55/spray can

Suppliers: Woodwards
Grocery Stores
Drug Stores

Notes and Samples

Thymol

Fungicide in crystal form; crystals vaporize to kill moulds, in fashion similar to moth crystals. Can be used as a liquid by dissolving 10% thymol be weight to volume of denatured alcohol. White paper can be immersed briefly in this solution, the excess solvent allowed to evaporate, and the thymol-impregnated sheets used to interleaf mildewed books, pages and prints.

NOTE: that "Mothballs" and other insect repellents based on naphtha and paradichlorobenzine may cause fading of dyes in textiles, watercolors, and other light sensitive materials, and may cause "feather rot". If you have an insect problem in your collections call a conservator or licensed professional exterminator immediately.

Price: $53.97/100 gms.

Suppliers: Fisher
Canlab
BDH Chemicals
Scientific Suppliers

Renaissance Wax

A combination of waxes made to a British Museum formula. Recommended for use on wood, ivory, bone and metals.

Apply sparingly.

Price: $9.00 per tin

Suppliers: Conservation Materials
Talas
Frank Joel

Aerowax Non-Yellowing Paste Wax

Notes and Samples

Appears to be relatively stable.

Price: 27 oz. = $4.09

Suppliers: Grocery and Hardware Stores

Goddard's Products

Goddard's Silver Care Cloth

This is recommended over other polishes (except in cases of exceptionally heavy tarnish build-up) because it cannot overclean as can Silver Dip and other liquids, nor leave residues. Contains a very fine polishing abrasive and an anti-tarnish compound. Limited effectiveness as anti-tarnish wrap. Can be used safely to polish other metals (but not lead or pewter).

Price: $4.49 each

Goddard's Silver Dip
Price: $3.00/12 oz. jar.

Goddard's Long Term Silver Polish
Price: $2.97/7 oz.

Goddard's Long Term Silver Foam
Price: $3.33/6 oz.

Goddard's Marble Polish
Price: $5.55/4 1/2 oz.

Goddard's "Glow"

A multi-purpose paste for brass, copper and chrome.
Price: $2.10/2 1/4 oz. tube.

Suppliers: Saveco Stores
Cowling and Brathwaite (a Goddard distributor)

Anti-Tarnish Tissue

Notes and Samples

This paper is specially treated with chemicals to absorb sulphur compounds from the air. It can be used for wrapping, lining storage boxes, for filters for air vents in display cases. It should not be in direct contact with metal. Wrap object first in acid-free tissue or Lithowipes, then in anti-tarnish paper. The anti-tarnish paper roll should be stored in a plastic bag.

Price: 7 3/4" w x 5 1/4" dia. roll = $11.30

Suppliers: Burco Jeweler's Tools

"Zerust" (formerly also sold as Silver Safe)

A solid block of vapor phase inhibitor. Prevents tarnish to silver, copper and inhibits the corrosion process of iron. Used in small enclosed spaces such as drawers, cupboards, display cases. Do not leave in contact with metal.

CAUTION: May not be suitable for permanent storage because it has been reported to turn paper yellow and form a yellow film on silver over long term.

Price: Minimum order: 6 units $37.80.

Suppliers: James Dawson Enterprises Ltd.

Pacific Silver Cloth

A dark brown velveteen cloth with built-in tarnish inhibitors, for lining drawers, display cases, storage bags. The material is always in short supply, and must be back ordered.

Price: $21.00/meter

Suppliers: Birks

Pacific Silvercloth

BY THE YARD

POSITIVELY PREVENTS TARNI

HOW INCREDIBLE PACIFIC SILVERCLOTH® CAN SAVE YOU FROM EVER POLISHING SILVER AGAIN!

A COMPLETE, ILLUSTRATED GUIDE TO MAKING YOUR OWN TARNISH-PREVENTING POUCHES.

FAST, EASY INSTRUCTIONS FOR LINING SIDEBOARDS, DRAWERS AND CABINETS

PLUS LOTS OF OTHER VALUABLE IDEAS AND USES FOR FABULOUS PACIFIC SILVERCLOTH

How incredible Pacific Silvercloth* can save you from ever polishing silver again!

Pacific Silvercloth is the exclusive tarnish-preventing material that keeps silver and silver-plated articles clean, bright and shining between uses... without polishing!

The reason? Thousands of fine silver particles embedded in rich brown Pacific Silvercloth absorb tarnish-producing gases before they reach the silver. Your sterling or silverplate retains it brilliant lustre, saves you polishing. Pacific Silvercloth also protects against dust and scratches.

...and what you can do with it

Pacific Silvercloth's convenient 38-inch width is easy to cut, sew and glue in making your own custom storage pouches, pocketed rolls, and linings for drawers and cabinets.

By carefully following the instruction in this booklet you can provide complete tarnish-preventing protection for all your silver possessions.

Pacific Silvercloth® Prevents Tarnish

Easy-to-make silver pouches for plates, platters and trays

1) Measure the length and width of your silver piece.

2) With pinking shears cut a rectangle of Pacific Silvercloth one inch longer and 2½ times wider than the article.

3) Fold to form a pouch as in Fig. 1.

4) Seam up both sides.

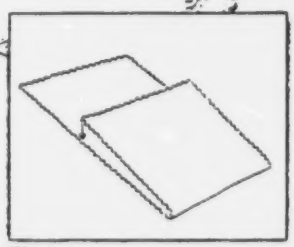


Fig. 1

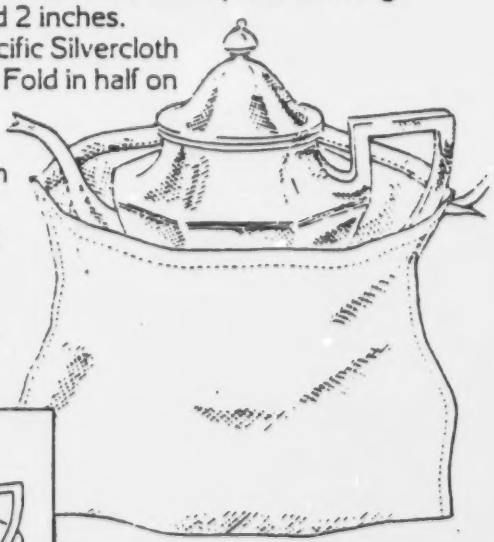
Custom bags for holloware

1) Run a measuring tape vertically around the entire silver piece as in Fig. 2-A. To this dimension add 4 inches.

2) Measure horizontally around the entire piece as in Fig. 2-B. Take half of this and add 2 inches.

3) Cut a rectangle of Pacific Silvercloth using these two dimensions. Fold in half on height dimension and stitch up the two sides.

4) Make a half-inch hem around the open mouth of the bag and run a drawstring (tape or ribbon) through it (see illustration). Or, if you prefer, finish your bag with a zipper fastener.



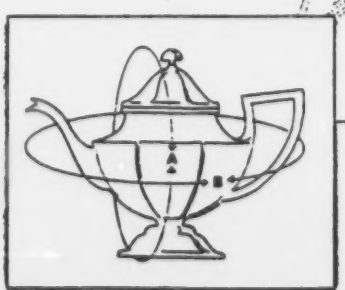
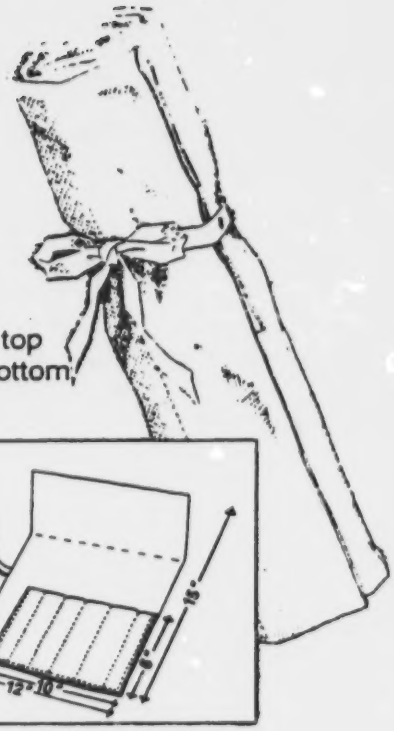


Fig. 2

Pocketed rolls for flatware



To make a 6-piece place-setting roll, luncheon or dinner size:

1) Cut two pieces of Pacific Silvercloth—15" × 12" and 10" × 6".

2) Place the smaller piece on top of the larger one. lined up at the bottom and right (Fig. 3).

3) Seam the two together.

4) Make three individual pockets 1½" wide, one pocket 2" wide, one 2½" wide, and one 1" wide.

5) Sew a piece of tape or ribbon on the outside to serve as a tie.

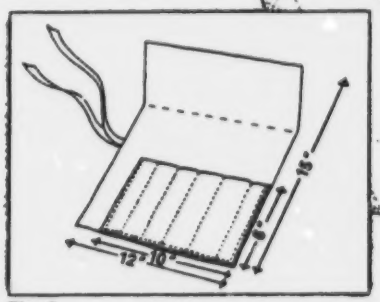
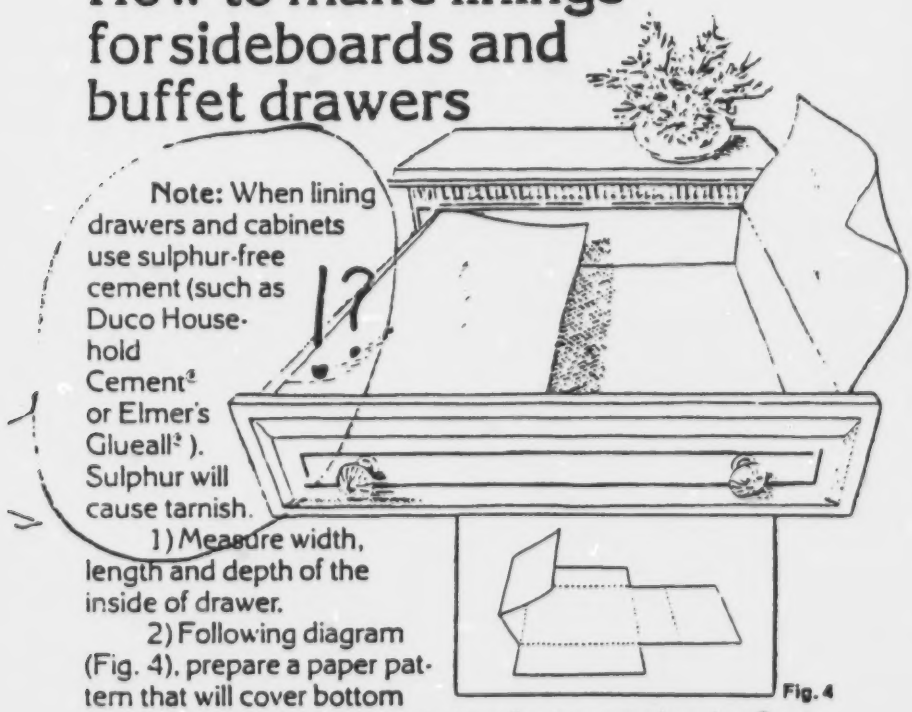


Fig. 3

How to make linings for sideboards and buffet drawers



Note: When lining drawers and cabinets use sulphur-free cement (such as Duco Household Cement® or Elmer's Glueall®). Sulphur will cause tarnish.

1) Measure width, length and depth of the inside of drawer.

2) Following diagram (Fig. 4), prepare a paper pattern that will cover bottom and four sides of drawer and allow for two overlapping flaps on either side.

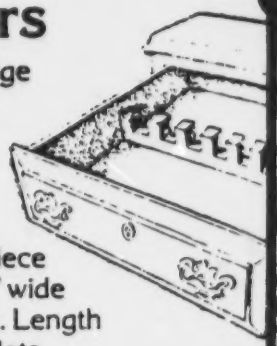
3) Cut Pacific Silvercloth to pattern.

4) Apply coat of cement to bottom and sides of drawer. Let dry slightly.

5) Set cloth in place, press down securely. When thoroughly dry, place silver inside—cover with flaps.

Fig. 4

Slotted bridges for silver drawers



A slotted bridge is handy to separate pieces of flat silver. To make it:

1) Use piece of wood 2¾" wide and ¾" thick. Length depends on slots you'll need.

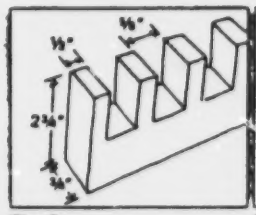


Fig. 5

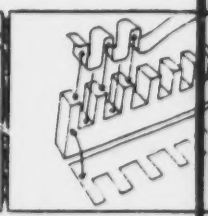


Fig. 6

2) Cut slots 1½" deep and 5/8" wide at ½" intervals through the ¾" edge (Fig. 5). A dado head on a circular saw will enable you to cut slots quickly and accurately.

To cover the bridge:

1) Cut a strip of Pacific Silvercloth ¾" wide and cover slots by gluing over and down between each separation. Use blade of a knife to press cloth into slot corners.

2) To cover sides of bridge cut two strips of cloth 2¾" wide. Cut out slots in each strip to match those in the wood (Fig. 6).

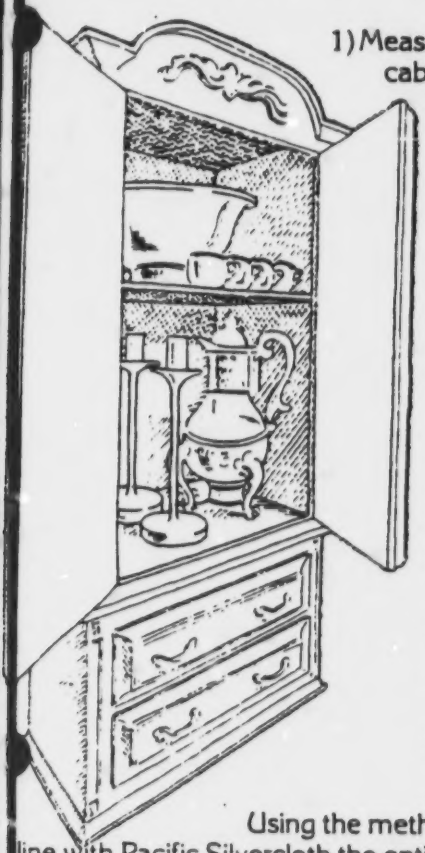
3) Glue a strip on either side.

4) Attach bridge to bottom of drawer with two light screws driven from underneath.

Note: The average drawer requires about 2 yards of Pacific Silvercloth.

Duco Household Cement® of E.I. DuPont de Nem
Elmer's Glueall® of Borden, Inc.

Cabinets for tall silver pieces



1) Measure each inside section of cabinet, cut cloth to fit as in the illustration.

2) To line: spread thin layer of cement on wooden surfaces. Press on cloth.

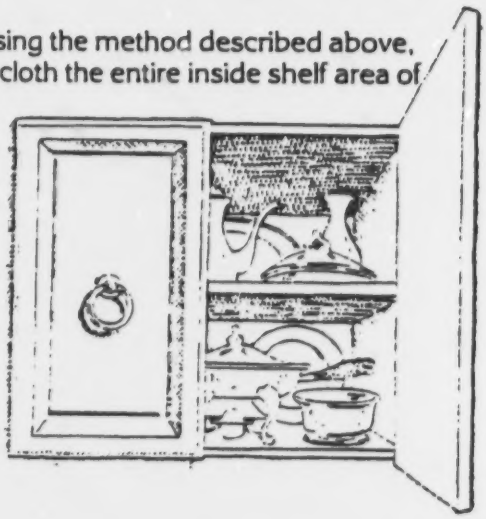
Front of cabinet can be done either:

1) By lining door.

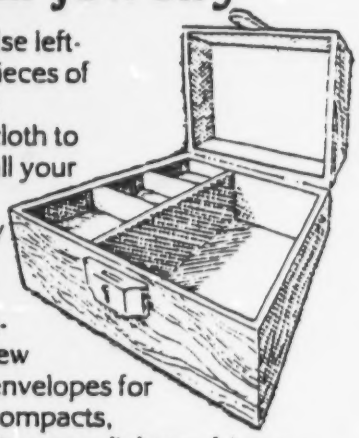
2) By allowing extra material to hang down from top, like a curtain, completely covering front.

How to convert your kitchen cabinet to a silver storer

Using the method described above, line with Pacific Silvercloth the entire inside shelf area of a kitchen cabinet, also doors. Store silver you don't use often on high shelves. Keep silver used daily close at hand.



And don't forget your jewelry



Use left-over pieces of Pacific Silvercloth to keep all your silver jewelry absolutely tarnish-free. Sew small envelopes for silver compacts, cigarette cases, lighters. Line a small drawer in your bedroom to hold all your silver jewelry. Or, select an attractive box, line it with Pacific Silvercloth and you'll have a perfect silver jewelry case.

How to store your silver

1) Place clean, dry silver into your Pacific Silvercloth containers, making sure that all parts are fully covered.

2) Do not wash Pacific Silvercloth, even if it becomes slightly discolored from absorbed tarnish.

3) Never use rubber bands on silver or Pacific Silvercloth. Rubber causes tarnish.

Wamsutta® Specialty Products Group
1430 Broadway
New York, N.Y. 10018

PRE-MADE PACIFIC SILVERPOUCHES® ARE NOW AVAILABLE IN SIX CONVENIENT SIZES WHEREVER FINE HOUSEWARES ARE SOLD.

PACIFIC SILVERCLOTH® PREVENTS TARNISH

PACIFIC SILVERCLOTH® PRICE LIST

Manufacturer's Put-Up	Four 125-yard rolls (500 yards per case)	$5.00/yard
Distributor's Put-Up	40-60 yard rolls	$5.25/yard
Retail Put-Up	10-15 yard rolls (6 rolls per case)	$5.50/yard

The above prices are based on minimum purchases of 500 yards. For smaller quantities (minimum 15 yards):

Distributor's Put-Up	200-499 yards	$5.50/yard
	60-199 yards	$5.75/yard
Retail Put-Up	200-499 yards	$5.75/yard
	90-199 yards	$6.00/yard
	15- 89 yards	$6.25/yard

F.O.B. Lyman, South Carolina

January 1, 1984

WAMSUTTA INDUSTRIAL DIV., 1430 BROADWAY, NEW YORK, N. Y. 10018 (212) 930-5368

Tapes

If you simply must use sticky tape, "3M Magic Mending Tape" is the most stable we know of. Do not use on objects or documents.

When double sided tape is required, for example for making mylar enclosures, 3M brand 415 tape is recommended. It has a neutral pH but is too sticky to be used directly on archival materials. It can be used for the construction of storage boxes, or document folders.

/415 - transparent, double-sided on a polyester carrier.

$ 6.84/roll - 1/4" x 36 yards
$10.30/roll - 1/2" x 36 yards

Suppliers: W.J. Stewart Co.
Conservation Materials

Notes and Samples

LABELS

"Tyvek" Labels

Notes and Samples

Pre-cut labels made from polypaper, white, with or without hole for string. Note: do not use the ones with the metal reinforced hole.

Suppliers: InterCity Papers

Acid-Free Labels

Plain white labels made of acid-free and buffered paper, with attached cotton fibre string. Three standard sizes available, can be made to customer specifications.

Price varies with size and number ordered.

Suppliers: Van Guard and Mouldings Inc.
Jane Dalley, Archival Conservation & Restoration Process Materials

3M Lab Label System for Labelling Bottles

A labeling system consisting of pads of paper labels, transparent solvent-proof rolls, and a dispenser. The label is written on, and affixed to the container with the tape. Price of the label depends on the size ordered. The tape must not be affixed to any artifact. Labels and tape are not acid-free.

Suppliers: Fisher
Canlab
3M Distributors

Dymo Labels

Notes and Samples

Plastic tape with an adhesive backing. Can be stuck on to containers, or have a hole punched in and be attached with string or wire. Wide range of colors available, in two widths. Requires machine to print.

NOTE: DO NOT APPLY DIRECTLY TO ARTIFACTS. Note that these tend to fall off unnoticed.

Suppliers: Miller's Stationers

SHEET MATERIALS, CLOTH

Unbleached Cotton (or Muslin)

Notes and Samples

Natural colored (off-white) 100% cotton cloth in a variety of weights, (light weight is best) used for dust covers and wrappings. Wash well before use to remove sizing.

Price: lightweight, loose weave = $1.20/m

Suppliers: Fabric stores

Terry Toweling

White, 100% cotton cloth, used as padding material. Should be washed before use to remove sizing and lint.

Price: $5.40/meter

Suppliers: Fabric Stores

Cheesecloth

Loose weave white cotton fabric available in packages or by the bolt, used for vacuuming, dusters.

Price: $2.49/5 yard package.

Suppliers: Fabric and Department Stores

Crepeline

(see also Stabiltex)

Silk chiffon in a range of colors.

Price: No. 1 natural = $9.25/yd.

Suppliers: Talas

Stabiltex

Notes and Samples

Polyester monofilament fabric similar to crepeline, in a range colors. Write to supplier for catalogue and samples.

Price: 40" w x 200 mesh = $17.10/yd.

Suppliers: B & SH Thompson

SHEET MATERIALS, PAPER

Archival Corrugated Board

Notes and Samples

Double wall cardboard, 1/4" thick, acid-free and buffered, light grey in color. 10 sheets to a package, price according to size.

Suppliers: Light Impressions

Archivart Papers

Solid color boards made of 100% cotton fibres, and pigment dyes, acid-free with an alkaline buffer added.

Write to company for samples, price lists and specifications.

Suppliers: Process Materials Corp.
Jane Dalley, Archival Cons. & Rest.
Van Guard and Mouldings Inc.

Acid-Free Mounting Board

100% rag board with a pH of 7.0 used as a support, backing material, or to construct small, acid-free boxes.

Prices vary according to size and thickness.

Sample price:
2 ply, 32 x 40 = $ 7.00/sheet
4 ply, 40 x 60 = $15.00/sheet

Suppliers: Art Supply Stores,
i.e. Opus Framing Supplies
Burlington Art Shop
Delta Paint
TH Morgan Ltd.
The Art Workshop

Acid-Free Matte Board, Colored

Notes and Samples

"Ademco" white acid-free board has a surface layer of colored paper, ranging from white to black, including reds and greens. The colored surface should not contact the object.

Prices vary with the size of the sheets.

Suppliers: Art Supply Stores

Permalife Paper

Acid-free paper, buffered with calcium carbonate to pH 8.0 to 8.5. Available in sheets, envelopes, file folders, in a range of shades from pure white to buff.

Write to suppliers for product catalogue.

Suppliers: Hollinger Corporation
Light Impressions
Archival Conservation Resources

Map Folders

Card weight Permalife paper, with Tyvek tape on folded seam.

Price: package of 5, 18" x 24" = $5.75

Suppliers: Light Impressions
Archival Conservation Resources

Acid-Free Tissue Paper, Hallmark #1

Notes and Samples

This is white tissue paper which has been washed acid-free, and is pH neutral (7.0). Used for any wrappings which come in direct contact with any object. This paper will absorb acids from air pollution, and should be kept in a polyethylene cover. Please note that this tissue is only acid-free and must not be used as a barrier against acid migration from wood or cardboard. Only Mylar Type D or aluminium foil is trustworthy as an acid barrier, although thick polyethylene will help.

Price: 40" w x 5" dia. roll = $62.00
500 sheets, 24" x 36" = $25.11

Suppliers: CIP Daxion Inc.

Interleaving Tissue Paper

White tissue paper, acid-free and buffered to a pH of 8.0 and 8.5.

Price varies with size of sheet.

Suppliers: Light Impressions
Archival Conservation Resources

Lithowipes

Lint and sulphur free paper napkins for cleaning and dusting of glass plates and lenses, photographs, and wrapping and dusting metal items.

Price: $25.88 per case.

Suppliers: Kimberly Clark/Crown Zellerbach Distributors

Paper Towels "Facelle Royal"

The white (not any other color) paper towels are reputed to be acid-free.

Price: $1.89/2 roll package

Suppliers: Grocery Stores

SHEET MATERIALS, SYNTHETIC

Polyethylene Sheeting

Polyethylene plastic in flexible sheet form, can be heat-sealed into bags, dust covers, wrapping.

Price depends on width and thickness of roll.

Suppliers: Western Concord
Hardware Stores
Department Stores

Polyethylene Tubing

Polyethylene plastic in tube form, for heat sealing into bags.

Price: 8" x 1000' x 6 mil = $ 96.24
12" x 1000' x 6 mil = $115.93
24" x 650' x 4 mil = $105.70

Suppliers: Western Concord

Polyethylene Bags

These are available in a variety of sizes. It is advisable to make them from polyethylene tubing or sheet, as not all storage or sandwich bags are polyethylene, and could react with artifacts over long periods.

Suppliers: Grocery Stores
Scientific Suppliers

Cushion Foam or Cellufoam

An expanded polyethylene foam sheet, in a range of thicknesses, useful for shelf and drawer liners, padding and wadding material. Chemically inert. Available in a variety of thicknesses and widths.

Sample price:
3/16" thick, 60" tall
300' long = $240.00

Suppliers: Shipper's Supply

Notes and Samples

Microfoam

Notes and Samples

This is also an expanded polyethylene foam sheet, similar to the Cushion Foam, but comes in "ply" form; single, double or triple. Thicker sheets can be peeled apart if necessary, or cut into nests, so it may be more versatile than Cushion Foam, but it has punched holes which make it unsuitable as a vapor barrier.

Price: 1/4" thick x 6' wide x 225' long roll, 3 ply - $215.00

Suppliers: Williams Industrial Supply

Lab Soakers

A quilted cellulose fiber sheet attached to a thin sheet of polyethylene, for worktable covers, padding and wrapping materials. (Not acid free).

Price: $90.00 per case, 20" wide 2 rolls per case

Suppliers: Canlab

"Bubblepack"

Fused polyethylene sheets with air pockets sealed inside.

Prices:

3/16" x 24" x 750' roll = $199.00
1/4" x 24" x 375' roll = $124.75
1/2" x 24" x 250' roll = $105.25

Suppliers: Packing Suppliers, i.e. General Fasteners
Shipper's Supply

Notes and Samples

Fibreglass Screen

A black, soft flexible screening, for making ventilated shelves, vacuum guards.

Price: from 30¢/yard , 28" wide
60¢/yard . 36" wide

Suppliers: Hardware stores

Plexiglass

A clear, solid acrylic sheet used to replace glass. Can be obtained with ultra-violet filter (UF-1 or 3) for framed items, and display cases.

Do not use in direct contact with documents, works of art or paper, or textiles. Do not use near materials with powdery surfaces such as pastels or charcoals, as the static electricity generated during dusting can pull loose particles off the paper.

UF-1 is sufficient for most purposes.

Price: UF-1, 4' x 8' x 1/8" thick sheet = $4.39 per square foot

Suppliers: Anthony Foster and Sons
Cadillac Plastics

Mylar Film

Must be Dupont Type D, virgin (virgin refers to it not being a recycled material).

A clear, inert polyester sheet. Does accumulate static electricity. Thickness from 3 mil to 10 mil.

Price: 3 mil, 200' x 50" = $229.60/roll

Supplier: Robco Inc.

Poly Paper

Notes and Samples

A paper-like sheet of polyethylene fibres, also known as "Tyvek". Can be cut and printed like paper but will not tear or fall apart when wet.

Available from Canlab in small sheets or prepasted labels, and from Intercity Papers as sheets or rolls. Kimball systems will print labels to customer specifications.

Also available from Davis Automotive Stores and Canadian Tire as automotive covers. These are useful as dust covers on large furniture and equipment where potential leaks make cloth dust sheets impracticable.

Sample price:
37" x 250 yds roll = $69.50
per 100 yards

Suppliers: InterCity Papers

"Coroplast"

(See also Tote Boxes)
A polypropylene/polyethylene copolymer, corrugated like cardboard. Acid free, durable: use to make boxes, containers, picture backings.

Sample price:
4' x 8' sheet, 4 mm. thick =
$13.33

Suppliers: Cadillac Plastics
Coroplast

"Corox"

Available in individual sheets from most plastics companies and is probably the same material as Coroplast.

PART IV: EVERYTHING IN ITS PLACE

Following, in alphabetical order, are the names, mailing addresses and telephone numbers of some suppliers of the materials mentioned in the foregoing pages.

Alberta Archival Photographic Services
f309, 3600 Brenner Dr. N.W.
Calgary, Alberta
T2E 1Y2
(403) 282-2126

Anthony Foster and Sons Ltd.
14630 - 123 Avenue
Edmonton, Alberta
T5L 2Y3
(403) 484-1133

Archival Conservation Resources
P.O. Box 2506 Station D
Ottawa, Ontario
K1P 5W6
(613) 523-9260

The Art Workshop
4624 - 99 Street
Edmonton, Alberta
(403) 434-5090

Beckman Instruments Inc.
Helipot Division
901 Oxford Street
Toronto, Ontario
M8Z 5T2
Att: Len Carter
(416) 677-1164

Birks Jewellers
126 Edmonton Center
Edmonton, Alberta
T5J 2Y8
(403) 426-7290
(Branch office in Calgary)

BDH Chemicals Canada Ltd.
9527 - 49 Street
Edmonton, Alberta
T6B 2L8
(403) 469-4411

B & SH Thompson
235 Montpellier Boulevard
St. Laurent
Montreal, Quebec
H4N 2G3

Burlington Art Shop
10349 Jasper Avenue
Edmonton, Alberta
(403) 428-1748

Burko Jeweller's Tools
12 Shooter Street
Toronto, Ontario
M5V 1A2
(416) 862-1655

CAE Morse Ltd.
4916 - 89 Street
Edmonton, Alberta
(403) 468-7001

Cadillac Plastic
15531 - 115A Avenue
Edmonton, Alberta
(403) 451-1650

Calgary Photo Distributors Ltd.
10548 - 115 Street
Edmonton, Alberta
T5H 3K6
(403) 426-2998

Canada Packers
(see Shur-Gain)

Canadian Conservation Institute (CCI)
1030 Innes Road
Ottawa, Ontario
K1A OM8
(416) 998-3721

Canadian Tire Stores
9857 - 50 Street
Edmonton, Alberta
T6A 3X5
(403) 465-0731
(Branches: across Canada)

Canlab
11620 - 181 Street
Edmonton, Alberta
T5S 1M6
(403) 453-3921

Carr McLean
461 Horner Avenue
Toronto, Ontario
M8W 4X2
(416) 252-3371 1-800-268-2138

CIP Daxion Inc.
16824 - 117 Avenue
Edmonton, Alberta
T5M 3S2
(403) 453-6741

Cole-Parmer Instrument Co.
P.O. Box 490 Station A
Scarborough, Ontario
M1K 5C3

Commercial Plastics & Supply Co.
47 Gurney Crescent
Toronto, Ontario
M6B 1S9
(416) 787-4214

Connolly Bros. (Curriers) Ltd.
39 - 43 Charlton Street
London, England
NW1 1JE

Conservation Materials, Ltd.
Box 2884 - 340 Freeport Blvd.
Sparks, Nevada 89431
USA
(702) 331-0582
Att: Dorothy & Douglas Adams

Coroplast
700 Vadnais Street
Granby, Quebec
J2J 1A7
(514) 378-3995

Cowling & Braithwaite Co. Ltd.
1050 McNicoll Avenue
Scarborough, Ontario
M1W 2L8
(416) 499-5814

Crown Zellerbach Paper Co. Ltd.
16408 - 121A Avenue
Edmonton, Alberta
(403) 452-2520

Jane Dalley
Archival Conservation & Restoration
Suite 311, 1660 Rue Notre Dame Ouest
Montreal, Quebec
H3J 1M1
(514) 937-5602

James Dawson Enterprises Ltd.
P.O. Box 984 Station B
Willowdale, Ontario
M2K 2R1
(416) 491-2496

Delta Paint
12504 - 118 Avenue
Edmonton, Alberta
(403) 455-7983

Dompro Ltd.
P.O. Box 3318
Sherwood Park, Alberta
T8A 2A6

EM Plastic & Electronic Products Ltd.
9152 Yellowhead Trail
Edmonton, Alberta
(403) 474-8245

Franklin Distributors Corp.
P.O. Box 320
Denville, New Jersey
07834 USA

Fisher Scientific
10720 - 178 Street
Edmonton, Alberta
(403) 483-2123

Frank W. Joel, Ltd.
P.O. Box No. 6
Downham Market
Norfolk, England
PE38 9ED

Gainer's Medical & Surgical Supply Ltd.
12520 Yellowhead Trail
Edmonton, Alberta
(403) 452-6071

General Fasteners Ltd.
13323 - 146 Street
Edmonton, Alberta
T5L 4S8
(403) 453-6141

Kodak Canada Inc.
3500 Eglington Avenue, W.
(416) 766-8233

Hollinger Corporation
P.O. Box 6185
3810 South Four Mile Run Drive
Arlington, VA
22206 USA

Light Impressions
439 Monroe Avenue
P.O. Box 940
Rochester, New York
14603 USA

IKEA
8170 - 50 Street (Parkway Village)
Edmonton, Alberta
T6B 1E6
(403) 469-0456
(Branches: Calgary, Vancouver)

Lundia, Inc.
600 Capitol Way
Jacksonville, ILL
62650 USA
(217) 243-8585

InterCity Papers
P.O. Box 3050 Station A
Mississauga, Ontario
L5A 3S7
(416) 275-8200

Mayfield Storage Systems
(Schaeffer)
10707 - 181 Street
Edmonton, Alberta
T5S 1N3
(403) 484-5702

Jeffery Moore Packaging
Bay 6, 2235 - 30 Avenue N.E.
Calgary, Alberta
T2C 7C7
(403) 276-4766

McBain Camera
10805 - 107 Avenue
Edmonton, Alberta
T5H 0W9
(403) 420-0404

Kimac Company
478 Long Hill Road
Guilford, Connecticut
06437 USA

Miller Office Group
4990 - 92 Avenue
Edmonton, Alberta
T6B 2W1
(403) 468-4990

Montel
225 - 4th Avenue
Montmagny, Quebec G5V 3I6
CP/B.O. Box 130
Montmagny, Quebec G5V 3S5
(418) 248-0235

Morgan, T.H. Ltd.
11018 - 127 Street
Edmonton, Alberta
(403) 455-4950

Nordraft Reprographics Group
10652 - 101 Street
Edmonton, Alberta
(403) 426-7820

Northern Eau Claire
Construction Materials Ltd.
9320 Yellowhead Trail
Edmonton, Alberta
T5G 0W4
(403) 477-3536

Optikon Corp. Ltd.
410 Conestogo Road
Waterloo, Ontario
N2L 4E2
(519) 885-2551

Opus
1360 Johnston Street
Vancouver, B.C.
V6H 3S1
(604) 688-0388

Perma Tubes
226 Sioux Road
Sherwood Park, Alberta
(403) 467-2844

Process Materials Corporation
301 Veteran's Boulevard
Rutherford, New Jersey
07070 USA

Pro-Western Plastics Ltd.
30 Riel Drive - P.O. Box 261
St. Albert, Alberta
T8N 1N3
(403) 459-4491

Robco Inc.
6037 - 103 Street
Edmonton, Alberta
T6H 2H3
(403) 436-3232

Safety Supply Co.
6120 - 99 Street
Edmonton, Alberta
(403) 436-1310

Sargent-Welch Scientific of
Canada, Ltd.
285 Garyray Drive
Toronto, Ontario
M9L 1P3
(416) 741-5210

Saveco Stores Ltd.
10736 Jasper Avenue
Edmonton, Alberta
T5J 2A5
(403) 423-3131

Saxe Archival Systems
C.P. 237 Succorsale Victoria
Westmount, Quebec
H3Z 2V5
(514) 747-2260

Science Associates
31 Airpark Road - Box 230-12
Princeton, New Jersey
08542 USA
(609) 924-4470

Shipley Photo Service
10344 - 105 Street
Edmonton, Alberta
(403) 423-4866

Shipper's Supply
5215 - 82 Avenue
Edmonton, Alberta
T6B 2J6
(403) 465-0927

Shur-Gain Division
Canada Packers
2727 Centre Avenue S.E.
Calgary, Alberta
TA2A 2L4
(403) 272-4076

Solar King Solar Control Products
P.O. Box 181
St. Albert, Alberta
T8N 1N3
(403) 458-2163

Solar Screen Co.
53 - 11 105 Street
Corona, New York
11368 USA

Spacesaver Corporation
1450 Janesville Avenue
Ft. Atkinson, Wisconsin
53538 USA
(414) 563-6362

W.J. Stewart Company
1970 Ellesmere Road, Unit 11
Scarborough, Ontario
M1H 2W1
(416) 438-2991

Talas
213 W. 35 Street
New York New York
10001 USA
(212) 736-7744

Tex-Pro Western Ltd.
1221 Franklin Street
Vancouver, B.C.
V6A 1J8
(604) 254-9551

United Farmers of Alberta Co-op Ltd.
12803 - 149 Street
Edmonton, Alberta
(403) 451-5480

Universal Plastics Ltd.
5302 - 72A Avenue
Edmonton, Alberta
T6B 2H9
(403) 465-1488

University Products
(see W.J. Stewart)

Van Guard & Mouldings Ltd.
222 Supertest Road
Downsview, Ontario
M3J 2M2
(416) 661-0111

Wellsdale Research Ltd.
P.O. Box 173
St. Albert, Alberta
T8N 1N3
(403) 459-0380

Western Concord Manufacturing Ltd.
14743 - 134 Avenue
Edmonton, Alberta
(403) 452-5681

Western Storage Systems Ltd.
16110 - 112 Avenue
Edmonton, Alberta
T2G 0H7

Wilcor Storage Systems Ltd.
10431 - 39A Avenue
Edmonton, Alberta
(403) 434-2692

Williams Industrial Supplies Ltd.
4625 - 101 Street
Edmonton, Alberta
(403) 438-2183

Wilson's Office Group
14303 - 128 Avenue
Edmonton, Alberta
T5K 4K6

Woodwards Stores Ltd.
Edmonton Center
102 Avenue & 100 Street
Edmonton, Alberta
T5J 0E7
(403) 424-0151
(Branches: Calgary, Lethbridge)